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(Mal)adaptive Emotionsregulationsprozesse: Konzeptualisierung, empirische Überprüfung und Intervention

DISSERTATION

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Zusammenfassung

Emotionsregulation stellt einen transdiagnostischen Faktor für die Entstehung und Aufrechterhaltung von Psychopathologie dar. Bisher ist allerdings unzureichend verstanden was eine adaptive gegenüber einer maladaptiven Emotionsregulation ausmacht, wieso sich Menschen für eine maladaptive Emotionsregulation entscheiden und ob ein Emotionsregulationstraining psychischen Störungen vorbeugen kann.

Deshalb wurde zunächst ein Modell der Emotionsregulation entworfen, das strategiebasierte Emotionsregulation, psychophysiologische Selbstregulation, Emotionsbewertungen und Emotionsdynamiken integriert (**Studie I**). Anschließend wurden aus dem Modell abgeleitete Hypothesen zum Zusammenhang von Emotionsbewertungen und strategiebasierter Emotionsregulation im Alltag empirisch überprüft (**Studie II**). Des Weiteren wurden adaptive Muster interagierender Regulationsstrategien im Hinblick auf paranoide Gedanken quer- und längsschnittlich in Stichproben mit unterschiedlicher Symptombelastung untersucht (**Studie III**). Zuletzt wurde die Wirksamkeit eines Gruppentrainings der Emotionsregulation für eine Risikostichprobe in einer randomisiert-kontrollierten Studie getestet (**Studie IV**).

Emotionsbewertungen als schädlich und Ressourcenbewertungen zur Akzeptanz/Toleranz als unzureichend sagten maladaptive Emotionsregulation vorher (**Studie II**). Ein angemessenes Emotionsverständnis moderierte den Zusammenhang zwischen Akzeptanz und paranoiden Gedanken (**Studie III**). Ein Emotionsregulationstraining verbesserte die adaptive Emotionsregulation, zeigte sich gegenüber einer Selbsthilfe-Kontrollbedingung allerdings nicht wirksamer in der Reduktion von Psychopathologie und der Prävention psychischer Störungen (**Studie IV**).

Die konzeptuellen Überlegungen und Befunde weisen darauf hin, dass (mal)adaptive Emotionsregulationsprozesse nicht alleine durch die Fähigkeit zur Umsetzung einzelner Regulationsstrategien zu erklären sind. Entsprechend zeigte sich, dass eine Verbesserung der Emotionsregulationsfähigkeiten für die Prävention von psychischen Störungen nicht ausreicht. Weitere Komponenten (mal)adaptiver Regulationsprozesse, wie Emotionsbewertungen, sollten in Emotionsregulationstrainings stärker berücksichtigt werden, um potenziell größere Effekte auf die Psychopathologie zu erzielen.

Abstract

Emotion regulation represents a transdiagnostic factor relevant to the development and maintenance of psychopathology. However, so far it has not been adequately understood what constitutes adaptive versus maladaptive emotion regulation, why people decide to regulate in a maladaptive way, and whether an emotion regulation training prevents the development of psychological disorders.

Therefore, a framework of emotion regulation was conceptualized that integrates the domains of strategy-based emotion regulation, psychophysiological self-regulation, emotion evaluations, and emotion dynamics (**study I**). Subsequently, hypotheses derived from the framework regarding associations between strategy-based emotion regulation and emotion evaluations were empirically tested in daily life (**study II**). Moreover, associations between adaptive patterns of interacting emotion regulation strategies and paranoid ideation were examined cross-sectionally and longitudinally in samples with different levels of symptom distress (**study III**). Finally, in a randomized controlled trial, the efficacy of a group-based emotion regulation training was examined in an at-risk sample (**study IV**).

Emotion evaluations as harmful and evaluations of resources to accept/tolerate as insufficient predicted maladaptive emotion regulation (**study II**). An adequate emotion comprehension moderated the association between acceptance and paranoid ideation (**study III**). An emotion regulation training enhanced adaptive emotion regulation. However, the training was not superior over a self-help control condition concerning the reduction of psychopathology and the prevention of psychological disorders (**study IV**).

The conceptual ideas and findings indicate that (mal)adaptive emotion regulation processes cannot not solely be explained by skills to apply single emotion regulation strategies. In line with this, enhancing strategy skills did not suffice to prevent psychological disorders effectively. Additional components of (mal)adaptive emotion regulation processes, such as emotion evaluations, should gain more attention in emotion regulation trainings to potentially enhance effects on psychopathology.

1. Theoretischer Hintergrund

1.1 Emotionsregulation und Psychopathologie

Menschen machen ihre psychische Belastung häufig an dem Erleben intensiver, unangenehmer Emotionen[1] fest. Sie empfinden ihre Emotionen dann oft als schädlich, fühlen sich im Umgang mit ihnen überfordert und versuchen sie loszuwerden. Diese Anstrengungen können die psychische Belastung langfristig wiederum verstärken.

Thompson (1994) nimmt an, dass das emotionale Erleben durch die Emotionsregulation beeinflusst wird. Emotionsregulation definiert er als extrinsische und intrinsische Prozesse der Beobachtung, Bewertung und Veränderung von Emotionen in ihrer Qualität, Intensität und Dauer. In empirischen Studien zeigen sich Zusammenhänge zwischen der Emotionsregulation und Psychopathologie. Menschen mit unterschiedlichen psychischen Störungen, wie psychotischen Störungen, Essstörungen, Borderline Persönlichkeitsstörung, depressiven Störungen, Angststörungen, Zwangsstörungen und Posttraumatischer Belastungsstörung gaben in retrospektiven Fragebogenstudien an, bestimmte Emotionsregulationsstrategien, wie Emotionsunterdrückung, Vermeidung und Grübeln, häufiger und andere Regulationsstrategien, wie kognitive Umbewertung, Problemlösen und Akzeptanz, seltener anzuwenden als gesunde Kontrollproband:innen (für ein Review, siehe Lincoln et al., 2022). Ähnliche Muster der Emotionsregulation konnten in subklinischen Stichproben mit Psychose-, Depressions- und Angst-Symptomen gefunden werden (Chapman et al., 2019; Osborne et al., 2017; Schäfer et al., 2017). Darüber hinaus legen Ergebnisse aus Längsschnittstudien nahe, dass der Gebrauch von Strategien, wie Grübeln sowie Schwierigkeiten in der Akzeptanz von Emotionen, die spätere Entwicklung von Psychopathologie begünstigen (Lincoln et al., 2022). Studien mit Mehrfachmessungen im Alltag über die Experience-Sampling Methode (ESM; vgl. Myin-Germeys et al., 2018) deuten zudem darauf hin, dass Strategien wie Emotionsunterdrückung, Vermeidung und Grübeln mit einer Verstärkung negativer Emotionen und anschließendem Auftreten von Psychose-, Posttraumatischen- und Essstörungssymptomen einhergehen (für eine Metaanalyse, siehe Boemo et al., 2022; Lincoln et al., 2022). Zusammenfassend ist daher festzustellen, dass

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[1] In der Dissertation wird der Begriff „Emotionen" nach der Definition von Schiller et al. (2022) verwendet als bewusste organismische Zustände, die ihren Ursprung in der Evolution haben, sich in physiologischen und neuronalen Kreisläufen implementieren, durch externe oder interne Stimuli angetrieben, aus biologischer und/oder psychologischer Bedeutung abgeleitet werden und die über eine allostatische Regulation dem Überleben und Fortbestehen dienen.

Emotionsregulation einen transdiagnostischen Prozess darstellt und eine entscheidende Rolle bei der Entstehung und Aufrechterhaltung von Psychopathologie spielt.

1.2 Emotionsregulation in der klinischen Praxis

Vor dem Hintergrund der Rolle der Emotionsregulation in der Entstehung und Aufrechterhaltung von Psychopathologie bildet die Emotionsregulation einen vielversprechenden Ansatzpunkt für klinische Interventionen. Frühe Interventionen mit einem Fokus auf die Emotionsregulation waren die Dialektisch-Behaviorale Therapie (DBT; Linehan, 1993) und die Akzeptanz und Commitment-Therapie (ACT; Hayes et al., 1999). Die DBT wurde primär zur Vermittlung von Skills zur Regulation von Anspannungszuständen und eines achtsamen und akzeptanzbasierten Umgangs mit Emotionen bei Menschen mit Borderline Persönlichkeitsstörung entwickelt. Die DBT wurde mittlerweile auch bei Menschen mit Substanzkonsum-, Ess-, Angststörungen und Depression angewendet und zeigte inkonsistente Ergebnisse in Bezug auf die Emotionsregulation (Harvey et al., 2019; Heath et al., 2021; Rozakou-Soumalia et al., 2021). Die ACT basiert auf der Annahme, dass psychologische Belastung durch maladaptive Bemühungen entsteht, Emotionen zu kontrollieren. Daraus leitet sich das Behandlungsrational ab, negative Emotionen bewertungsfrei wahrzunehmen und zu akzeptieren, anstatt diese verändern zu wollen (Blackledge & Hayes, 2001). Die ACT erwies sich wirksam für die Reduktion verschiedener Symptomgruppen, wie Psychose-, Depressions- und Angstsymptomen (Öst, 2014).

Weitere Programme mit einem spezifischen Fokus auf der Emotionsregulation sind beispielsweise die Emotions-Regulations-Therapie (ERT; Mennin, 2004), das Unified Protocol (UP; Barlow, 2011) und das Training Emotionaler Kompetenzen (TEK; Berking, 2008). Die ERT wurde als Einzeltherapie für Menschen mit Depression und Angststörungen konzeptualisiert und beinhaltet Übungen zur Achtsamkeit, Akzeptanz, mitfühlender Selbstunterstützung und kognitiver Umbewertung sowie Expositionsübung in sensu. Die ERT wurde in einer Reihe randomisiert-kontrollierter Studien untersucht und erwies sich als wirksam im Hinblick auf die Emotionsregulation und Linderung von Symptomen, wie zum Beispiel Depressions- und Angstsymptomen (Renna et al., 2017). Das UP ist ein manualisiertes, transdiagnostisches Emotionsregulationsprogramm, das ursprünglich für ein Einzeltherapie-Setting konzipiert wurde. Das UP zeigte sich wirksam im Hinblick auf die Reduktion diverser Symptomgruppen und die Veränderung der Emotionsregulation (Cassiello-Robbins et al., 2020; Sakiris & Berle, 2019).

Das TEK ist ein manualisiertes, transdiagnostisches Gruppentraining. Das Training beginnt mit einer Psychoedukation über Emotionen und ihrer Funktion sowie zu ihrem

neurowissenschaftlichen und psychophysiologischen Hintergrund, gefolgt von sechs praktischen Modulen zu verschiedenen Emotionsregulationsfertigkeiten: (1) Muskel- und Atementspannung (2) Bewertungsfreie Wahrnehmung und Benennung von Emotionen (3) Akzeptanz und Toleranz von Emotionen (4) Effektive Selbstunterstützung (5) Analysieren von Emotionen und (6) Modifikation von Emotionen. Das TEK erwies sich als wirksam für die Verbesserung der Emotionsregulation und der Psychopathologie als Ergänzung zu einer stationären kognitiven Verhaltenstherapie bei Menschen mit Depression (Berking et al., 2013), als eigenständige Intervention im Vergleich zu einer Warteliste-Kontrollgruppe bei Menschen mit Depression (Berking et al., 2019) und Binge Eating Störung (Berking et al., 2022). Zudem gibt es vorläufige Hinweise auf eine Wirksamkeit in Bezug auf die Emotionsregulation in subklinischen Gruppen von Polizist:innen (Berking et al., 2010) und Altenpfleger:innen (Buruck et al., 2016). Empirische Studien zu den verschiedenen Emotionsregulationsprogrammen sprechen daher für eine Wirksamkeit in der Behandlung von Menschen mit psychischen Störungen.

Befunde zur Rolle der Emotionsregulation in der Entstehung von psychischen Störungen lassen darüber hinaus vermuten, dass ein Emotionsregulationstraining einen wirksamen Präventionsansatz darstellen könnte. Das TEK bietet sich für einen Einsatz in der Prävention besonders an, weil es als transdiagnostisches, niedrigschwelliges Gruppentraining konzipiert wurde, das auch in subklinischen Gruppen mit verschiedenen Symptomen eingesetzt werden kann. Studien zeigen, dass Symptome, wie Psychose-, Depressions-, und Angstsymptome auf einem Kontinuum von subklinischen Stufen mit niedriger Symptomfrequenz und Symptombelastung bis hin zu klinisch relevanten Symptomfrequenzen- und Belastungen auftreten (Lewinsohn et al., 2000; Van Os et al., 2009). Subklinisch mischen sich diese Symptome, beeinflussen sich gegenseitig und sind pluripotent, das heißt sie können in verschiedene psychische Störungen übergehen (Hartmann et al., 2019; Stochl et al., 2015; van Os, 2013). Dementsprechend argumentieren eine Reihe von Forschenden, dass transdiagnostische Präventionsprogramme besonders hilfreich sind, weil sie (1) eine große Zielgruppe ansprechen (2) das Problem einer frühen Stigmatisierung von symptomspezifischen Ansätzen vermeiden und das Potenzial haben (3) eine breite Gruppe an Symptomen zu reduzieren und darüber (4) den Übergang in verschiedene psychische Störungen zu verhindern (Fusar-Poli et al., 2014; Guloksuz & van Os, 2018; McGorry et al., 2018). Das TEK bietet diese Vorteile und empfiehlt sich entsprechend als transdiagnostisches Präventionsprogramm. Bisher wurde das TEK in subklinischen Stichproben allerdings lediglich im Hinblick auf eine Verbesserung der

Emotionsregulation und noch nicht für die Reduktion von Psychopathologie oder die Prävention der Entwicklung psychischer Störungen untersucht.

1.3 Adaptive Emotionsregulation

Basierend auf den empirischen Zusammenhängen zwischen den einzelnen Regulationsstrategien und Psychopathologie wurden zum einen Strategien, wie Emotionsunterdrückung, Vermeidung und Grübeln, als maladaptiv und zum anderen kognitive Umbewertung, Problemlösen und Akzeptanz als adaptiv klassifiziert (Aldao et al., 2010). Diese eindeutige Klassifizierung einzelner Regulationsstrategien steht allerdings in der Kritik. Diese Kritik ist unter anderem in Studien begründet, die darauf hindeuten, dass die Effektivität von Regulationsstrategien von Kontextfaktoren, wie der Qualität und Intensität einer Emotion oder äußeren Einflüssen, abhängt und damit nicht uniform ist (Aldao & Nolen-Hoeksema, 2012; Bonanno & Burton, 2013). Entsprechend können als maladaptiv klassifizierte Strategien, wie die Emotionsunterdrückung, in bestimmten Kontexten durchaus negative Emotionen reduzieren (Bonanno & Burton, 2013). Hinzu kommen Ergebnisse, die Unterschiede der Strategien in ihrer kurz- und langfristigen Effektivität aufzeigen. In einer Experimentalstudie konnte Emotionsunterdrückung zum Beispiel eine kurzfristige Reduktion subjektiv berichteter negativer Emotionen bewirken, hatte aber langfristige negative Konsequenzen (z.B. anhaltende Aktivierung der Amygdala und Insula, präfrontale, inhibitorische Kontroll-Bemühungen; Goldin et al., 2008). Akzeptanz im Gegensatz erwies sich in ESM Studien kurzfristig wenig effektiv in der Reduktion negativer Emotionen, hatte aber langfristig positive Konsequenzen (mehr positive Emotionen, niedrigere Atemfrequenz und Herzrate; Campbell-Sills et al., 2006; Dan-Glauser & Gross, 2015; Heiy & Cheavens, 2014; Hofmann et al., 2009).

Der eindeutigen Klassifizierung von Strategien als adaptiv oder maladaptiv stehen zudem Ergebnisse entgegen, die zeigen, dass die Zusammenhänge zwischen maladaptiven Emotionsregulationsstrategien (z.b. Grübeln, Emotionsunterdrückung) und Psychopathologie zwar relativ robust, die zwischen sogenannten adaptiven Regulationsstrategien (z.B. kognitive Umbewertung) und Psychopathologie allerdings heterogen sind (Lincoln et al., 2022). Dies betrifft beispielsweise den Zusammenhang zwischen Emotionsregulation und psychotischen Positivsymptomen. Während hier deutliche Zusammenhänge mit maladaptiven Regulationsstrategien gefunden wurden, zeigen nur wenige Studien einen negativen Zusammenhang mit der als adaptiv klassifizierten Strategie der kognitiven Umbewertung. Eine Reihe von Studien weisen keine signifikanten Zusammenhänge zwischen adaptive Strategien

und psychotischen Positivsymptomen auf (für eine Metaanalyse, siehe Ludwig et al., 2019). Diese Asymmetrie ist überraschend, angesichts positiver Effekte von Interventionsstudien zur Vermittlung von adaptiven Strategien in Bezug auf die Symptomverbesserung. Sie legt nahe, dass der isolierte Blick auf die Frequenz der Nutzung einzelner sogenannter adaptiver Regulationsstrategien den komplexen Zusammenhang zwischen adaptiver Emotionsregulation und Psychopathologie nicht angemessen erklären kann.

Ein Großteil der Forschung zu den Zusammenhängen zwischen Emotionsregulation und Psychopathologie begrenzt sich bisher auf die Zusammenhänge einzelner Regulationsstrategien und Psychopathologie (vgl. Ludwig et al., 2019; Visted et al., 2018). Tatsächlich zeigen Studien, dass Menschen nicht eine, sondern mehrere Strategien im Umgang mit einer Emotion anwenden (für ein Review, siehe Ford et al., 2019). Diese Befunde deuten zudem darauf hin, dass Kombinationen von Regulationsstrategien adaptiv und damit der Anwendung einzelner Regulationsstrategien überlegen sein könnten (vgl. Aldao et al., 2015; Bonanno & Burton, 2013; Heiy & Cheavens, 2014). Dementsprechend könnten Kombinationsmuster von Regulationsstrategien wichtige Bedingungsfaktoren für eine Adaptivität der Emotionsregulation darstellen. Bisher ist allerdings noch unzureichend verstanden, wie parallel angewendete Regulationsstrategien im Zusammenspiel wirken und Emotionsregulationsmuster bilden, die adaptiv im Hinblick auf Psychopathologie sind. Während weitere mögliche Bedingungsfaktoren, wie situative Kontextfaktoren, schwer zu erfassen und eine Flexibilität für Kontextfaktoren in Interventionen schwer zu vermitteln ist, bietet ein besseres Verständnis für das Zusammenspiel von Regulationsstrategien die Chance, adaptive Regulationsmuster zu identifizieren, die in der klinischen Praxis vermittelt werden können.

1.4 Emotionsbewertungen

Sowohl Experimentalstudien (Liu & Thompson, 2017; Opoka et al., 2021; Zilverstand et al., 2017), als auch ESM Studien (Ludwig et al., 2020; Ruscio et al., 2015; Visser et al., 2018; Zetsche et al., 2021) legen nahe, dass Menschen mit psychischen Störungen negative Emotionen mithilfe sogenannter adaptiver Strategien ähnlich erfolgreich reduzieren können wie gesunde Kontrollproband:innen. Diese Befunde widersprechen der Vermutung, dass Menschen mit psychischen Störungen generell Defizite in der Umsetzung von Regulationsstrategien haben. Zudem zeigen ESM Studien, dass Menschen mit psychischen Störungen im Alltag nicht nur sogenannte maladaptive, sondern auch adaptive Strategien häufiger anwenden als gesunde Kontrollproband:innen (Kircanski et al., 2015; Ludwig et al., 2020; Visser et al., 2018). Demnach

scheinen Menschen mit psychischen Störungen eher ein „zu viel" an maladaptiven Strategien als ein „zu wenig" oder eine ineffektive Umsetzung adaptiver Strategien aufzuweisen (vgl. Lincoln et al., 2022). Bisher ist allerdings noch unzureichend verstanden, welche Faktoren Menschen dazu veranlassen mehr maladaptive Regulationsstrategien zu nutzen als andere Menschen, obwohl sie in der Lage wären sogenannte adaptive Strategien erfolgreich anzuwenden.

Wie Menschen ihre Emotionen bewerten, könnte eine entscheidende Rolle dafür spielen, wie sie ihre Emotionen regulieren. Diese Emotionsbewertungen betreffen zum Beispiel die Kontrollierbarkeit von Emotionen. Eine Reihe von Studien deutet darauf hin, dass Überzeugungen über Emotionen als unkontrollierbar mit einer stärkeren Nutzung von maladaptiven Strategien, wie der Vermeidung, einhergehen, während Überzeugungen über eine hohe Kontrollierbarkeit die Nutzung der kognitiven Umbewertung begünstigen (für Reviews, siehe Ford & Gross, 2018; Kneeland et al., 2016). So konnte auch experimentell nachgewiesen werden, dass eine Manipulation in Richtung einer verringerten Kontrollüberzeugung über eine vermehrte Emotionsvermeidung zu klinischen Symptomen führte (De Castella et al., 2017). Eine experimentelle Stärkung der Kontrollüberzeugung hingegen förderte die Anwendung der kognitiven Umbewertung (Kneeland et al., 2016). Diese Zusammenhänge wurden auch in ESM Studien bestätigt, in denen generelle Kontrollüberzeugungen zur Baseline mit der Nutzung von kognitiver Umbewertung im Alltag assoziiert waren (Kneeland et al., 2020; Ortner & Pennekamp, 2020). Im Einklang mit diesen Befunden zeigten sich Zusammenhänge zwischen Emotionsbewertungen und Psychopathologie, wie zum Beispiel Depression und Angststörungen (für Reviews, siehe Deplancke et al., 2022; Kneeland et al., 2016). Neben Bewertungen bezüglich der Kontrollierbarkeit wurden Annahmen über Emotionen als schädlich beziehungsweise hilfreich untersucht. Hier zeigte sich, dass Annahmen über Emotionen als generell schädlich mit einem vermehrten Gebrauch maladaptiver Regulationsstrategien, wie der Emotionsunterdrückung, assoziiert waren. Annahmen über Emotionen als hilfreich hingegen gingen mit der Anwendung adaptiver Strategien, wie der kognitiven Umbewertung, einher (Karnaze & Levine, 2018). Daraus lässt sich schließen, dass sowohl Überzeugungen bezüglich der Kontrollierbarkeit als auch Überzeugungen bezüglich der Schädlichkeit von Emotionen eine Rolle für die Emotionsregulation spielen.

Bisher wurden Kontrollüberzeugungen und Überzeugungen über die Schädlichkeit von Emotionen noch nicht gemeinsam in einem Modell untersucht. Um zu verstehen, ob diese Überzeugungstypen einen separaten Einfluss auf die Emotionsregulation haben oder

interagieren, ist eine gemeinsame Analyse jedoch erforderlich. Außerdem fällt bei einem Großteil der bisherigen Forschung auf, dass sie sich auf den Zusammenhang zwischen Kontrollüberzeugungen und der modifikatorischen Strategie der kognitiven Umbewertung konzentriert. Unklar bleibt dabei bisher, was Menschen dazu veranlasst, non-modifikatorische Strategien, wie Akzeptanz, anzuwenden. Akzeptanz hat nicht das Ziel eine Emotion zu verändern, sondern mit der Emotion in Kontakt zu bleiben und sie ihrem natürlichen Verlauf zu überlassen, ohne auf Kontrollversuche zurückzugreifen (für eine Definition von Akzeptanz, siehe Campbell-Sills et al., 2006; Hofmann et al., 2009). Zudem beschränken sich bisherige Studien auf generelle Überzeugungen über Emotionen. Allerdings nahmen Ford und Gross (2018) an, dass sich die Emotionsbewertungen je nach situativem Kontext und der aktuellen Emotion verändern. Es bleibt also zu überprüfen, inwieweit Bewertungen spezifischer Emotionen in einzelnen Situationen mit einer anschließenden Emotionsregulation assoziiert sind. Eine Klärung dieser offenen Fragen hat das Potenzial, Zusammenhänge im Alltag zwischen spezifischen Emotionsbewertungen und diversen Optionen im Umgang mit Emotionen differenzierter vorhersagen zu können. Entsprechende Untersuchungen könnten somit dazu beitragen, die relevante Frage zu beantworten, wieso Menschen mit psychischen Störungen vermehrt maladaptive Emotionsregulationsstrategien nutzen, obwohl sie fähig sind adaptive Strategien erfolgreich anzuwenden.

1.5 Modelle der Emotionsregulation

Um komplexe Emotionsregulationsprozesse besser zu verstehen, braucht es Modelle, die Hypothesen generieren und einen Rahmen für empirische Untersuchungen geben. Ein für die Forschung besonders einflussreiches Modell der Emotionsregulation ist das Extended Process Model von Gross (2015). In diesem Modell beschreibt Gross ineinandergreifende Wertungszyklen, in denen Personen Stimuli differenzieren, wahrnehmen, als negativ oder positiv im Hinblick auf persönlich relevante Ziele bewerten und entsprechend reagieren, um diese Stimuli zu verändern. Nach Gross kann die Wertung von Stimuli zur Erzeugung einer Emotion führen (z.B. kann die Bewertung von Höhe als bedrohlich Angst auslösen). Sobald ein emotionserzeugender Wertungszyklus selbst Input für einen weiteren Wertungszyklus wird, spricht Gross von Emotionsregulation. Emotionsregulation beschreibt er als einen Prozess mit drei Schritten, die als Wertungszyklen ineinandergreifen: (1) die Identifikation des Bedarfs nach Regulation (2) die Auswahl einer geeigneten Strategie und (3) die Umsetzung der ausgewählten Strategie, um die Emotion zu verändern. Emotionsregulationsstrategien lassen sich in Gross'

Modell unterteilen gemäß dem Zeitpunkt an dem sie im Prozess ansetzen. Er unterscheidet Strategien der Auswahl bzw. Vermeidung von Situationen in denen Emotionen auftreten könnten, der Veränderung von Aspekten der Situation, der Aufmerksamkeitslenkung in einer Situation, des Umdenkens über die auslösende Situation und der Modulation der emotionalen Reaktion. Das Extended Process Model bietet eine wichtige Grundlage für eine Reihe von empirischen Untersuchungen. Der Schwerpunkt der auf dem Modell basierenden empirischen Forschung lag lange Zeit auf der Frequenz und der Umsetzung von Regulationsstrategien (Aldao et al., 2010; Brans et al., 2013; Brockman et al., 2017; Webb et al., 2012). Weitere Komponenten des Modells gelangten erst in den letzten Jahren in den Fokus.

So beschäftigten sich Ford und Gross (2018) konzeptuell mit der Rolle von Emotionsbewertungen für die Emotionsregulation. Sie nahmen an, dass Emotionsbewertungen als gut versus schlecht (bzw. hilfreich vs. schädlich) und als kontrollierbar versus unkontrollierbar die Emotionsregulation beeinflussen. Diese Konzeptualisierung zeigt Ähnlichkeiten mit früheren Coping Modellen, in denen es nicht um den Umgang mit Emotionen, sondern um den Umgang mit externen Anforderungen geht. Lazarus und Folkman (1987) nahmen an, dass der Umgang mit Anforderungen in der Umwelt davon abhängt, wie Personen (1) die motivationale Relevanz eines Stimulus bezüglich seiner potenziellen Schädlichkeit und (2) ihre persönlichen Ressourcen zur Bewältigung der externen Anforderung bewerten (vgl. Kontrollierbarkeit). Ferner gingen Lazarus und Folkman von einem Zusammenspiel der beiden Bewertungen (1) und (2) aus. Genauer erwarteten sie, dass eine Bewertung eines Stimulus als schädlich Coping Anstrengungen motiviert. Wenn die persönlichen Ressourcen die Anforderung bewältigen zu können als angemessen bewertet werden, erwarteten sie daraufhin eine Bewertung der Anforderung als machbare Herausforderung und in der Folge adaptives Coping. Wenn ein Stimulus als potenziell schädlich und die Ressourcen zur Bewältigung als unzureichend bewertet werden, erwarteten sie eine Gesamtbewertung der Anforderung als bedrohlich und demzufolge maladaptives Coping. Dieses Zusammenspiel der Bewertungstypen findet im Modell zu Emotionsbewertungen bei Ford und Gross (2018) keine Berücksichtigung. Somit lässt die Forschung zu Emotionsbewertungen bisher keine Rückschlüsse darauf zu, ob diese einen unabhängigen Einfluss auf die Emotionsregulation haben oder interagieren. Außerdem konzentrieren sich Ford und Gross auf Kontrollüberzeugungen und lassen damit außer Acht, dass es neben den modifikatorischen oder emotionsverändernden Strategien auch non-modifikatorische Regulationsstrategien gibt, die nicht auf die Kontrolle von Emotionen abzielen. Das Modell von Lazarus und Folkman (1987) hingegen bezieht auch Bewertungen der

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persönlichen Ressourcen zur Akzeptanz einer externen Anforderung mit ein. Damit ist ihr Modell konzeptuell in der Lage Strategien, wie Akzeptanz, vorherzusagen und bietet damit eine hilfreiche Anregung für ein erweitertes Modell der Emotionsbewertungen, das auch die Akzeptanz von Emotionen vorhersagen kann.

Ein Grund dafür, dass non-modifikatorische Strategien, wie Akzeptanz, im Extended Process Model sowie dem darauf aufbauenden Modell der Emotionsbewertungen von Ford und Gross (2018) wenig Berücksichtigung finden, liegt bei der zugrundeliegenden Kontrolltheorie (vgl. Tamir, 2020). Diese Theorie nimmt negative Feedbackschleifen zur Reduktion einer wahrgenommenen Diskrepanz zwischen dem Ist- und Sollzustand an (Carver & Scheier, 1982). Das Extended Process Model von Gross setzt entsprechend voraus, dass sogenannte ungesunde Emotionen durch die erfolgreiche Anwendung von modifikatorischen Regulationsstrategien reduziert werden (Gross et al., 2019). Diese Konzeptualisierung impliziert, dass eine erfolgreiche Emotionsregulation in der kurzfristigen Reduktion von Emotionen besteht. Allerdings steht diese Annahme durch Befunde zu Unterschieden in der kurz- und langfristigen Wirkung von Emotionsregulationsstrategien sowie durch eine Reihe von Studien in Frage, die Zusammenhänge zwischen individuell unterschiedlichen Emotionsdynamiken (zeitliche Veränderungen emotionalen Erlebens; Kuppens & Verduyn, 2017) und Psychopathologie fanden (Houben et al., 2015; Nittel et al., 2018; Santangelo et al., 2014; Thompson et al., 2012; Vansteelandt et al., 2013). Eine Adaptivität bzw. Maladaptivität von Emotionsregulation ist demnach besser zu bewerten hinsichtlich damit assoziierter Emotionsdynamiken und langfristiger Auswirkungen auf die Psychopathologie als im Hinblick auf kurzfristige Emotionsreduktionen.

Kappas (2011) kritisierte am Extended Process Model zudem, dass das Modell ein endloses Fortbestehen von Emotionen bis zu deren Modifikation annehme. Aus seiner Sicht hingegen sind Emotionen selbstregulierend: sie motivieren Verhalten, das emotionsauslösende Stimuli beendet und sie regulieren sich automatisch über eine psychophysiologische Selbstregulation. Die Kritik von Kappas kann teilweise dadurch entkräftet werden, dass sich Verhalten, das emotionsauslösende Stimuli beendet, über Veränderungen in emotionserzeugenden Wertungszyklen in das Extended Process Model einbetten lässt (vgl. Yih et al., 2019). Tatsächlich liegt der Fokus des Modells von Gross und der auf seinem Modell basierenden Forschung deutlich auf Kontrollstrategien und es fehlt eine Referenz zur psychophysiologischen Selbstregulation. Forschung im Bereich der psychophysiologischen Selbstregulation zeigt, dass Prozesse abseits der strategiebasierten Emotionsregulation eine entscheidende Rolle für die

Emotionsregulation spielen. So nahm beispielsweise McEwen (1998) in seinem Allostatic Load Model an, dass im neuroendokrinen System, dem autonomen Nervensystem und dem Immunsystem selbstregulatorische Prozesse ablaufen, die bei Stress eine Homöostase wiederherstellen können. Empirische Studien deuten zudem darauf hin, dass diese Prozesse durch genetische oder Umweltfaktoren beeinträchtigt werden können, was sich in einer geringeren psychophysiologischen Adaptivität widerspiegelt (Danese & McEwen, 2012). Diese Einschränkungen in der psychophysiologischen Adaptivität könnten demnach einen Teil der Schwierigkeiten in der Emotionsregulation erklären. Darüber hinaus könnte ein Verständnis des Zusammenspiels psychophysiologischer Prozesse und strategiebasierter Emotionsregulation dazu beitragen, die Wirkung von Strategien zu ergründen, die nicht auf eine Reduktion von Emotionen abzielen, wie beispielweise Akzeptanz.

Bei den gängigen Emotionsregulationsprogrammen (siehe 1.2) fällt auf, dass sie sich nicht direkt aus dem prominentesten Emotionsregulationsmodell, dem Extended Process Model (Gross, 2015) ableiten. Auch Hofmann (2015) und Lincoln et al. (2022) merkten an, dass das Modell von Gross nur einen begrenzten Einfluss auf die klinische Praxis hat. Gross et al. (2019) machen durchaus konkrete Vorschläge, wie das Extended Process Model für die klinische Praxis genutzt werden könnte. Sheppes et al. (2015) zeigen auf, wie einzelne Elemente aus Emotionsregulationstrainings in das Extended Process Model eingebettet werden können und einige Emotionsregulationstrainings nutzen Komponenten des Modells für psychoedukative Zwecke und fördern eine Erweiterung des modifikatorischen Strategierepertoires (z.B., Barnow et al., 2016; Mennin & Fresco, 2014; Sakiris & Berle, 2019). Allerdings liegt der Schwerpunkt der gängigen Emotionsregulationstrainings auf erlebnisorientierten, achtsamkeits- und akzeptanzbasierten Techniken aus der DBT und ACT. Gerade die akzeptanzbasierten Ansätze aus der klinischen Praxis unterscheiden sich stark von der Grundidee von Gross. Im Gegensatz zu Gross, der als eine gesunde Emotionsregulation die erfolgreiche Kontrolle ungesunder Emotionen benennt (vgl. Gross et al., 2019), sieht Hayes (1999) einen Grund für anhaltende mentale Belastung in maladaptiven Anstrengungen negative Gefühle kontrollieren zu wollen und eine gesunde Regulation in der Akzeptanz ungewollter innerer Zustände. Zusammenfassend lässt sich entsprechend festhalten, dass das Extended Process Model und die darauf basierenden Weiterentwicklungen einen entscheidenden Grundstein für die empirische Emotionsregulationsforschung legen. Allerdings lassen sich akzeptanzbasierte Ansätze aus der klinischen Praxis nur unzureichend in das Modell integrieren und der Wirkungszusammenhang non-modifikatorischer Strategien auf die mentale Gesundheit nicht schlüssig erklären.

Inspiriert von klinischen Emotionsregulationsprogrammen formulierten Berking und Whitley (2014) das Modell zum konstruktiven Umgang mit Gefühlen, das sowohl modifikatorische, als auch non-modifikatorische Strategien im Umgang mit Emotionen einbezieht. Genauer wird im Modell adaptive Emotionsregulation konzeptualisiert als eine Sequenz beginnend mit der Fähigkeit (1) eine Emotion wahrzunehmen (2) eine Emotion zu benennen (3) die Emotion und ihre Ursache zu verstehen (4) und sich selbst mitfühlend zu unterstützen, um Ressourcen für die Regulation bereitzustellen. Diese Fähigkeiten (1-4) stellen eine Basis dar, um die Emotion entweder (5) zu modifizieren oder (6) zu akzeptieren und auszuhalten. Modifikationsstrategien haben das Ziel, ein Gefühl zu verändern und umfassen beispielsweise das Problemlösen oder die kognitive Umbewertung. Akzeptanz und Toleranz als non-modifikatorische Strategien hingegen werden angewendet, wenn das Gefühl nicht veränderbar ist oder ein Versuch der Veränderung mit hohen Kosten verbunden wäre. Zuletzt umfasst das Modell noch die (7) Konfrontation mit emotional belastenden Situationen. Diese Strategie soll neue Erfahrungen und das Lernen eines adaptiven Umgangs mit Emotionen ermöglichen. Das Modell von Berking und Whitley (2014) schafft ein eingängiges Verständnis für adaptive Emotionsregulationsprozesse sowie eine Verbindung von vorbereitenden, non-modifikatorischen und modifikatorischen Strategien. Somit zeigt das Modell auch Muster adaptiver Emotionsregulation über ein entsprechendes Zusammenspiel von Regulationsstrategien auf. Allerdings lässt das Modell offen, über welche Mechanismen die Strategien auf Emotionen wirken. So fehlt dem Modell von Berking und Whitley eine Referenz zur psychophysiologischen Selbstregulation und zu Emotionsbewertungen, es bleibt unklar aus welchen Gründen Menschen auf bestimmte Strategien zurückgreifen und über welche Mechanismen non-modifikatorische Strategien eine Veränderung von Emotionen ermöglichen.

2. Ziele, Relevanz und Forschungsfragen

Eine Vielzahl von Studien weist auf eine entscheidende Rolle der Emotionsregulation in der Entstehung und Aufrechterhaltung von Psychopathologie hin. Gleichzeitig stehen eine Reihe von Befunden der Annahme entgegen, dass sich adaptive und maladaptive Emotionsregulation alleine durch die Frequenz der Nutzung und die Fähigkeit zur erfolgreichen Umsetzung einzelner Regulationsstrategien erklären lassen. Bisher ist jedoch noch unzureichend verstanden, was adaptive Emotionsregulationsprozesse gegenüber maladaptiven Emotionsregulationsprozessen ausmacht und wieso Menschen auf eine maladaptive Emotionsregulation zurückgreifen. Zudem wurde bislang noch unzureichend erforscht, ob eine

Veränderung der Emotionsregulation über ein Emotionsregulationstraining wirksam für die Prävention von psychischen Störungen ist.

Deshalb wird in der vorliegenden Dissertation in **Studie I** zunächst ein integratives Emotionsregulationsmodell entworfen, das die Komponenten der strategiebasierten Emotionsregulation, der psychophysiologischen Selbstregulation, der Emotionsbewertungen und der Emotionsdynamiken zusammenbringt, um maladaptive und adaptive Emotionsregulation besser zu verstehen. Aus dem Modell werden Hypothesen zum Zusammenspiel der Komponenten, unter anderem von Emotionsbewertungen und Emotionsregulation abgeleitet, die in **Studie II** empirisch untersucht werden. **Studie II** soll somit zu einem Verständnis beitragen, inwieweit Emotionsbewertungen Menschen dazu veranlassen Emotionen adaptiv oder maladaptiv zu regulieren. In **Studie III** wird empirisch geprüft, inwieweit interagierende Regulationsstrategien mit paranoiden Gedanken assoziiert sind. Damit soll Studie III dazu beitragen adaptive Muster der Emotionsregulation zu identifizieren. In **Studie IV** wird schließlich die Wirksamkeit eines Emotionsregulationstrainings in der Prävention untersucht, um zu beleuchten, ob eine Förderung der adaptiven Emotionsregulation Psychopathologie reduzieren und psychischen Störungen vorbeugen kann.

Die Ziele der vorliegenden Dissertation sind es demnach zum einen (mal)adaptive Emotionsregulationsprozesse differenzierter verstehbar zu machen und zum anderen die Rolle der Emotionsregulation für die Prävention psychischer Störungen zu untersuchen. Damit soll die Dissertation dazu beitragen, dass zukünftige Interventionen Emotionsregulation gezielter adressieren und darüber Psychopathologie wirksamer reduzieren können.

Zusammenfassung der Studien

3. Zusammenfassung der Studien

Tabelle 1
Übersicht über die Studien der Dissertation

	Studie I	Studie II	Studie III	Studie IV
Referenz	Nowak, U.*, Wittkamp, M. F.*, Clamor, A., & Lincoln, T. M. (2021). Using the ball-in-bowl metaphor to outline an integrative framework for understanding dysregulated emotion. *Frontiers in psychiatry, 12*, 626698.	Wittkamp, M. F., Nowak, U., Clamor, A., & Lincoln, T. M. (2022). How you think about an emotion predicts how you regulate: an experience-sampling study. *Cognition and Emotion, 36*(4), 713-721.	Wittkamp, M. F., Krkovic, K., & Lincoln, T. M. (2021). An analysis of the pattern of adaptive emotion regulation associated with low paranoid ideation in healthy and clinical samples. *Cognitive Therapy and Research, 45*(3), 468-479.	Wittkamp, M. F., Krkovic, K., & Lincoln, T. M. (2022). Efficacy of a transdiagnostic emotion regulation training for people at risk of developing serious mental health problems. [Manuscript submitted for publication]. Institute of Psychology, Universität Hamburg.
Ziele	Konzeption eines integrativen Modells, um Emotionsregulation im klinischen Kontext besser zu verstehen.	Empirische Überprüfung des Zusammenhangs zwischen Emotionsbewertungen und Emotionsregulation.	Empirische Überprüfung des Zusammenhangs adaptiver Regulationsmuster und paranoider Gedanken.	Empirische Wirksamkeitsüberprüfung eines Gruppentrainings der Emotionsregulation in der Prävention.
Forschungsfragen	1. Wie kann das Zusammenspiel strategiebasierter Emotionsregulation, psychophysiologischer Selbstregulation und von Emotionsbewertungen über Abweichungen in Emotionsdynamiken Psychopathologie erklären? 2. Wie lässt sich das Verständnis dieses Zusammenspiels nutzen, um bisher unerklärte Befunde aufzuklären und klinische Interventionen zu verbessern?	1. Erhöht die Bewertung einer Emotion als schädlich die Wahrscheinlichkeit für anschließende Emotionsregulation? 2. Erhöht die Bewertung persönlicher Ressourcen eine Emotion modifizieren zu können als angemessen die Wahrscheinlichkeit für die Anwendung einer modifikatorischen (vs. non-modifikatorischen) Regulationsstrategie? 3. Erhöht die Bewertung einer Emotion als schädlich und Bewertungen persönlicher Ressourcen die Emotion modifizieren oder akzeptieren zu können als unzureichend die Wahrscheinlichkeit für die Anwendung einer maladaptiven (vs. adaptiven) Regulationsstrategie?	1. Stärken ein angemessenes Emotionsverständnis und Selbstunterstützung die negative Assoziation zwischen der Modifikation von Emotionen und paranoiden Gedanken? 2. Stärken ein angemessenes Emotionsverständnis und Selbstunterstützung die negative Assoziation zwischen Akzeptanz/Toleranz von Emotionen und paranoiden Gedanken?	Ist das Training Emotionaler Kompetenzen (TEK) in einer Risikogruppe wirksamer als eine Selbsthilfe-Bibliotherapie in Bezug auf 1. die Prävention von psychischen Störungen? 2. eine Reduktion allgemeiner Psychopathologie? 3. eine Reduktion psychotischer, depressiver und ängstlicher Symptome? 4. eine Verbesserung der adaptiven Emotionsregulation?
Konstrukte	• Strategiebasierte Emotionsregulation • Psychophysiologische Selbstregulation • Emotionsbewertungen • Emotionsdynamiken	• Emotionsbewertung (hilfreich – schädlich) • Bewertung von Ressouren modifizieren, aushalten, akzeptieren zu können • Regulation versus keine Regulation • Modifikatorische versus non-modifikatorische Strategien • Maladaptive versus adaptive Strategien	• Emotionsverständnis • Mitfühlende Selbstunterstützung • Modifikation • Akzeptanz/Toleranz	• Diagnosen einer psychischen Störung • Allgemeine Psychopathologie • Psychotische, depressive, ängstliche Symptome • Emotionsregulation

Zusammenfassung der Studien

Fortführung Tabelle 1	Studie I	Studie II	Studie III	Studie IV
Sample	k.A.	N = 118 Proband:innen aus Bevölkerungsstichprobe	(Studie A) N = 125 gemischte Stichprobe: Proband:innen mit psychotischer Störung, mit einem Risiko für die Entwicklung einer psychotischen Störung, gesunde Proband:innen (Studie B) N = 138 Proband:innen mit erhöhtem Risiko für die Entwicklung einer psychischen Störung (siehe Studie IV)	N = 138 Proband:innen mit erhöhtem Risiko für die Entwicklung einer psychischen Störung
Design	Überblick über Forschungsbereiche, Nutzung und Weiterentwicklung einer Metapher, Entwicklung eines Modells, Ableitung von Hypothesen	Längsschnittliches Design, Experience-Sampling Methode über 7 Tage mit 10 täglichen, paarweisen Messungen	(Studie A) Querschnittliches Design (Studie B) Längsschnittliches Design, Experience-Sampling Methode über 6 Tage mit 5 täglichen Messungen	Randomisiert-kontrolliertes Design mit aktiver Kontrollgruppe, Verlaufs- und Follow-Up Messungen nach 6 und 12 Monaten, Experience-Sampling Methode über 6 Tage mit 5 täglichen Messungen
Analysen	k.A.	Mehrebenenanalysen, Multinomial	(Studie A) Multiple Regressionsanalyse (Studie B) Mehrebenenanalysen, Binomial, Probit	Chi-Square Tests, Mehrebenenanalysen, Intention-to-treat Analysen, Complete Case Analysen
Befunde	k.A.	Wenn Personen eine Emotion als schädlich bewerten, ist die Wahrscheinlichkeit höher für eine anschließende Emotionsregulation. Wenn Personen eine Emotion als schädlicher und ihre Ressourcen das Gefühl akzeptieren und auszuhalten zu können als unzureichender bewerten, nutzen sie eher maladaptive Regulationsstrategien.	Akzeptanz ist mit paranoiden Gedanken nur dann negativ assoziiert, wenn Emotionen angemessen verstanden werden.	Das Training Emotionaler Kompetenzen ist wirksamer als Selbsthilfe-Bibliotherapie in der Verbesserung der Emotionsregulation im Alltag, allerdings nicht in der Prävention psychischer Störungen, der Reduktion allgemeiner Psychopathologie und von Symptomen.

Anmerkungen: (Studie I) † Geteilte Erstautor:innenschaft

3.1 Studie I: Entwicklung eines integrativen Modells der Emotionsregulation

Einleitung

Eine Vielzahl von Studien sprechen für Zusammenhänge zwischen Schwierigkeiten der Emotionsregulation und Psychopathologie (Lincoln et al., 2022). Forschende haben sich diesen Zusammenhängen über verschiedene, bisher relativ isolierte Forschungsfelder genähert: Strategiebasierte Emotionsregulation, psychophysiologische Selbstregulation, Emotionsbewertungen und Emotionsdynamiken. Diese Ansätze haben bereits zu einem großen Erkenntnisgewinn geführt (Baumeister et al., 2014; Ford & Gross, 2018; Houben et al., 2015; Lincoln et al., 2022). Allerdings bleiben einige Befunde, wie beispielweise die Wirkweise von Akzeptanz oder die Nutzung maladaptiver Strategien bei tatsächlichen Fähigkeiten adaptive Strategien erfolgreich anzuwenden, unerklärt. Somit haben die Erkenntnisgewinne einen begrenzten Mehrwert für die klinische Praxis. Eine Integration der genannten Forschungsfelder verspricht, unerklärte Befunde aufzuklären und hat das Potenzial den klinischen Nutzen zu steigern. Bislang ist eine umfassende Integration allerdings noch nicht erfolgt. Um eine eingängige Metapher der Emotionsregulation zu entwerfen, soll die Metapher einer Kugel in einer Schale als Basis genutzt werden (für die Grundidee der Metapher, anwendbar auf verschiedene Regulationsprozesse, siehe Boker, 2015). Die für die Emotionsregulation adaptierte Metapher soll Zusammenhänge der verschiedenen Regulationskomponenten illustrieren und in ihrer Komplexität reduzieren, um ein Modell und empirisch überprüfbare Hypothesen abzuleiten.

Methode

In dem theoretischen Artikel werden zunächst die wichtigsten Modelle sowie der aktuelle Forschungsstand in den jeweiligen Forschungsfeldern kurz zusammengefasst und bestehende Schwächen der isolierten Herangehensweise aufgeführt. Erste Fortschritte, die durch eine Integration bestehender Ansätze erreicht wurden, werden erläutert. Anschließend wird eine Metapher (Ball-in-Bowl Metapher) eingeführt, welche die vier Forschungsfelder

illustrativ zusammenführt. Zuletzt werden anhand der Metapher ein integratives Modell der Emotionsregulation und empirisch überprüfbare Hypothesen abgeleitet.

Ball-in-Bowl Metapher
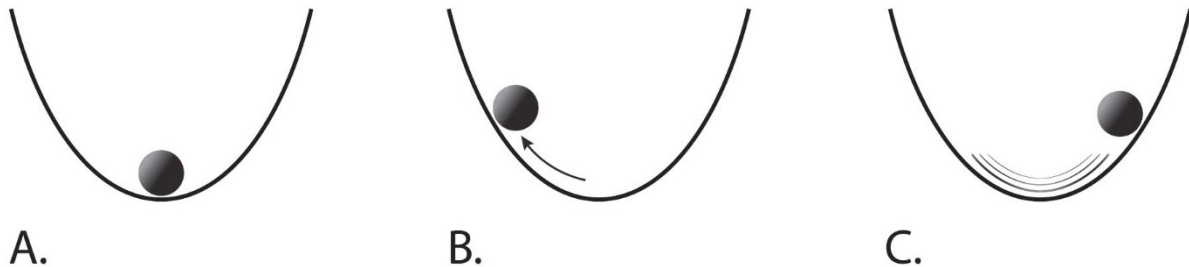
Abbildung 1. Die Abbildung zeigt die grundlegenden Merkmale der Ball-in-Bowl Metapher. A. Die Kugel ist im Normalzustand am Boden der Schale [entspricht einer geringen Emotionsintensität]. B. Eine externe Kraft kann die Kugel entlang der Schalenwand bewegen [Emotion wird ausgelöst, die Amplitude der Kugelbewegung entspricht der Emotionsintensität]. C. Sobald die äußere Kraft nachlässt, nimmt auch die Bewegung der Kugel ab [Veränderungen der Amplitude entsprechen Emotionsdynamik].
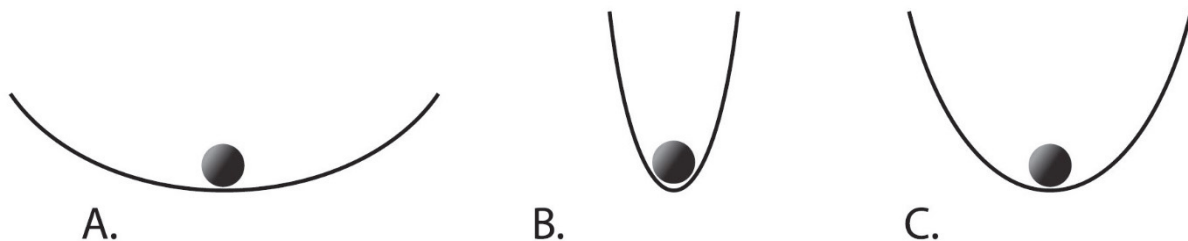
Abbildung 2. Die Abbildung zeigt den Unterschied zwischen sehr flachen, sehr steilen und mittelgradig geformten Schalen und damit die Rolle psychophysiologischer Selbstregulation. A. In sehr flachen Schalen kann eine äußere Kraft die Kugel schnell auslenken und es dauert lange, bis diese zum Boden der Schale zurückkehrt [entspricht geringer psychophysiologischer Selbstregulations-Kapazität]. B. In sehr steilen Schalen führt nur eine sehr starke Kraft zur Auslenkung [entspricht hoher psychophysiologischer Rigidität]. C. Die mittelgradige Form erlaubt eine Auslenkung der Kugel durch äußere Kraft und ein zeitnahes Auslaufen der Kugelbewegung [entspricht angemessener psychophysiologischer Selbstregulations-Kapazität].
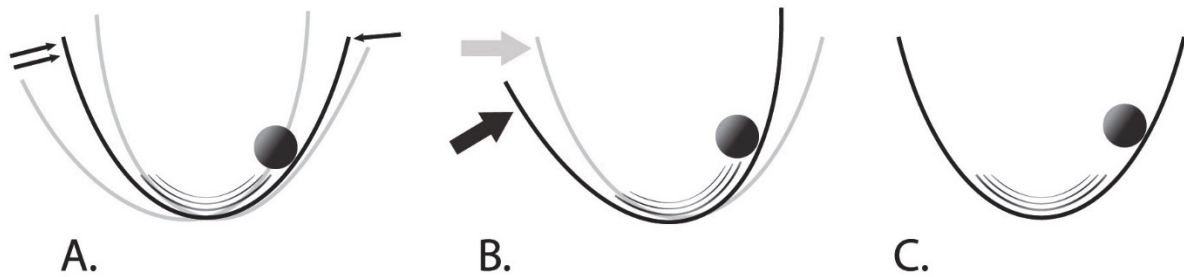
Abbildung 3. Die Abbildung zeigt den Effekt verschiedener Auslenkungen der Schale auf die Bewegung der Kugel und damit den Effekt von strategiebasierter Emotionsregulation. A. Hektisches, ineffektives Kippen verhindert, dass die Kugel zum Equilibrium zurückkehrt [entspricht der Anwendung maladaptiver Regulationsstrategien]. B. Geschicktes, effektives Kippen der Schale hingegen führt zu einer zeitnahen Reduktion der Kugelbewegung [entspricht der Anwendung adaptiver Strategien]. C. Das Stillhalten der Schale führt langfristig zur Reduktion der Kugel-Bewegung durch die Krümmung der Schale [entspricht der Anwendung von Akzeptanz, Toleranz].
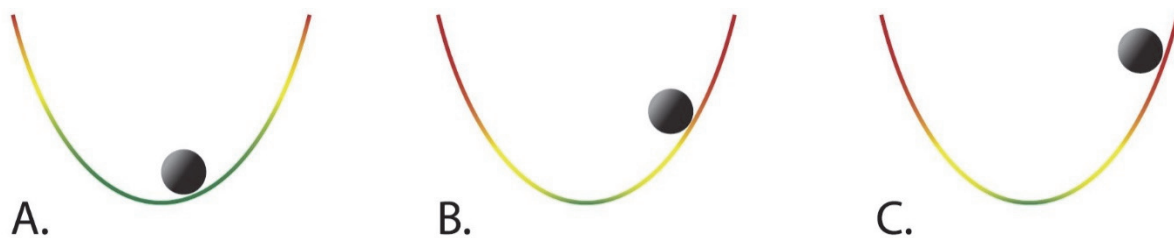
Abbildung 4. Die Abbildung zeigt farbige Zonen der Schale und damit den Einfluss von Emotionsbewertungen. Die Breite der Färbung der Schüsselwand variiert [entspricht variierenden Emotionsbewertungen nach Lernerfahrungen, Kontext etc.]. Die Zonen werden aktiviert, sobald die Amplitude der Kugel diese erreicht. A. Die grüne Zone zeigt an, dass die Bewegungen der Kugel sicher sind [entspricht einer Emotionsbewertung als hilfreich]. B. Die gelbe Zone zeigt ein moderates Risiko für die Bewegungen der Kugel an [entspricht einer Emotionsbewertung als herausfordernd, d.h. einer Bewertung der Emotion als schädlich und der persönlichen Regulationsressourcen als angemessen]. C. Die rote Zone zeigt ein hohes Risiko dafür an, dass die Kugel über den Rand der Schale hinaussteuert [entspricht einer Emotionsbewertung als bedrohlich, d.h. einer Bewertung der Emotion als schädlich und der persönlichen Regulationsressourcen als unzureichend].

Modell und abgeleitete Hypothesen

In dem aus der Ball-in-Bowl Metapher abgeleiteten integrativen Modell der Emotionsregulation entsteht eine maladaptive Emotionsregulation durch das Zusammenspiel maladaptiver Emotionsregulation, maladaptiver psychophysiologischer Selbstregulation und dysfunktionaler Emotionsbewertungen. Dies schlägt sich in abweichenden Emotionsdynamiken nieder, welche zu Psychopathologie führen können. Im Folgenden sind beispielhaft Hypothesen aufgeführt, die das Zusammenspiel spezifizieren:

Hypothese 1: Eine geringe psychophysiologische Selbstregulation erschwert die strategiebasierte Emotionsregulation. Im Gegenzug kompensiert die adaptive, strategiebasierte Emotionsregulation für eine geringe psychophysiologische Selbstregulation oder psychophysiologische Rigidität.

Hypothese 2: Emotionsbewertungen als bedrohlich sind assoziiert mit der Nutzung maladaptiver Regulationsstrategien, wie Grübeln oder Gefühlsunterdrückung. Diese Anwendung von maladaptiven Regulationsstrategien ist wiederum assoziiert mit abweichenden Emotionsdynamiken und kontinuierlichen Regulationsbemühungen. Im Gegensatz führt eine Emotionsbewertung der Emotion als herausfordernd (aber bewältigbar) dazu, dass adaptive Strategien, wie Akzeptanz oder kognitive Umbewertung, angewendet werden.

Diskussion

Durch das integrative Modell der Emotionsregulation, das auf der Basis der illustrierten Ball-in-Bowl Metapher entstanden ist, lassen sich überprüfbare Hypothesen ableiten. Somit gibt das Modell einen Rahmen, um bisher unerklärte Befunde verstehbarer zu machen und das Verständnis adaptiver und maladaptiver Regulationsprozesse zu verbessern. Zum Beispiel könnten die positiven Effekte der non-modifikatorischen Strategien Akzeptanz und Toleranz auf die mentale Gesundheit dadurch erklärt werden, dass sie nicht selbst zur direkten Reduktion einer Emotion führen, sondern psychophysiologischen Selbstregulationsprozessen eine Regulation ermöglichen. Außerdem könnten sich Befunde anhaltend hoher Level negativer Emotionen bei intakter strategiebasierter Emotionsregulation durch Schwierigkeiten in der psychophysiologischen Selbstregulation oder durch dysfunktionale Emotionsbewertungen erklären lassen. In der klinischen Praxis kann die Ball-in-Bowl Metapher als einfaches, intuitives Erklärungsmodell zur Veranschaulichung komplexer Regulationsprozesse in der Psychoedukation genutzt werden, aus dem zudem individualisierte Interventionen abgeleitet werden können. Aus einer individuellen Fallkonzeption heraus kann dann sowohl an

strategiebasierter Emotionsregulation (z.B. über Emotionsregulationstrainings), psychophysiologischer Selbstregulation (z.B. über Entspannungsverfahren, Herzratenvariabilität Biofeedback Trainings, Sport) als auch an den Emotionsbewertungen (z.B. über Techniken aus der kognitiven Therapie) angesetzt werden. Für die Anwendung des Modells ist zu beachten, dass es zunächst lediglich Hypothesen generiert, die es in empirischen Studien zu überprüfen gilt, um die Gültigkeit des Modells zu beweisen. Zudem erhebt das Modell sowie die Ball-in-Bowl Metapher keinen Anspruch auf Vollständigkeit und diverse Erweiterungen sind denkbar.

3.2 Studie II: Empirische Überprüfung des Zusammenhangs zwischen Emotionsbewertungen und Emotionsregulation

Wittkamp, M. F., Nowak, U., Clamor, A., & Lincoln, T. M. (2022). How you think about an emotion predicts how you regulate: an experience-sampling study. *Cognition and Emotion*, *36*(4), 713-721. https://doi.org/10.1080/02699931.2022.2027744

Einleitung

Angesichts einer Vielzahl an Möglichkeiten auf Emotionen zu reagieren, stellt sich die Frage, was Menschen zu einem bestimmten Umgang mit Emotionen veranlasst. Forschungsarbeiten konnten zeigen, dass Überzeugungen bezüglich der Schädlichkeit und Kontrollierbarkeit von Emotionen eine entscheidende Rolle für deren Regulation spielen (Ford & Gross, 2018). Bisher begrenzt sich ein Großteil der Forschung in diesem Bereich auf Trait Messungen allgemeiner Überzeugungen über Emotionen, wenngleich Ford und Gross (2018) annahmen, dass sich diese Überzeugungen kontextspezifisch (d.h. im State) wandeln können. Ferner beschränkt sich die Forschung weitestgehend auf Assoziationen mit den Strategien der Gefühlsunterdrückung und der kognitiven Umbewertung, wobei noch unzureichend erklärt ist, was Personen zur Anwendung anderer Strategien, wie Akzeptanz, veranlasst. Darüber hinaus wurden Überzeugungen bezüglich der Schädlichkeit und der Kontrollierbarkeit bisher separat untersucht. Damit bleibt unklar inwieweit diese Überzeugungen einen unabhängigen Einfluss auf die Nutzung von Regulationsstrategien nehmen oder im Zusammenspiel wirken. Deshalb wurden in dieser Studie die Hypothesen aus Studie I zum Zusammenhang zwischen Emotionsbewertungen und Emotionsregulation empirisch überprüft. Genauer wurde untersucht wie (1) eine Bewertung einer Emotion als schädlich versus hilfreich und (2) die Bewertung persönlicher Ressourcen diese Emotion modifizieren oder akzeptieren/tolerieren zu können im Alltag assoziiert sind mit der anschließenden Nutzung von Regulationsstrategien. Wir

erwarteten, dass eine Bewertung einer Emotion als schädlich die Wahrscheinlichkeit für eine anschließende Regulation der Emotion erhöht (Hypothese 1). Außerdem, dass eine Bewertung der Regulationsressourcen zur Modifikation die Wahrscheinlichkeit für die Nutzung modifikatorischer gegenüber der Nutzung non-modifikatorischer Strategie erhöht und umgekehrt, dass eine Bewertung der Regulationsressourcen zur Akzeptanz/Toleranz die Wahrscheinlichkeit für die Nutzung non-modifikatorischer gegenüber modifikatorischer Strategien erhöht (Hypothese 2). Darüber hinaus erwarteten wir, dass eine Bewertung einer Emotion als schädlich die Wahrscheinlichkeit für die Anwendung einer maladaptiven gegenüber einer adaptiven Regulationsstrategie erhöht und Bewertungen der Regulationsressourcen (modifizieren, akzeptieren/tolerieren zu können) als unzureichend diesen Zusammenhang verstärken (Hypothese 3).

Methode

Im Rahmen eines größeren Projekts zur Überprüfung der aus Studie I abgeleiteten Hypothesen, rekrutierten wir eine Stichprobe der Allgemeinbevölkerung N = 118 zwischen 18 – 65 Jahren. Um Zusammenhänge im Alltag zu beleuchten, wurde die ESM angewendet. Die Proband:innen erhielten über sieben Tage hinweg, zehn paarweise, tägliche Signale in semi-zufälligen Abständen (Zufälligkeit eingeschränkt durch Zeitrahmen von >60 min; Wheeler & Reis, 1991) zur Beantwortung von kurzen Fragebögen über ein Smartphone. Zu einem ersten Messzeitpunkt (t) beurteilten sie auf visuellen Analogskalen die Valenz (extrem unwohl/unzufrieden – extrem wohl/zufrieden) und das Arousal (extrem ruhig/entspannt – extrem unruhig/angespannt; vgl. Wilhelm & Schoebi, 2007) der aktuellen Emotionen sowie die Bewertung der jeweiligen Emotionen (vorteilhaft/hilfreich – schädlich/gefährlich) und der persönlichen Ressourcen die Emotionen verändern, akzeptieren und aushalten zu können (trifft nicht zu – trifft voll und ganz zu). Zu einem zweiten Messzeitpunkt mit drei Minuten Verzögerung (t+3 min) gaben sie mit Hilfe einer Single-Choice Liste ihren Umgang mit den entsprechenden Emotionen seit Messzeitpunkt t an. Die Liste umfasste zehn, für die Studie erstellte, Items des möglichen Umgangs mit Emotionen: keine Nutzung von Regulationsstrategien, keine Emotion die eine Regulation erforderlich machte, Akzeptanz, Toleranz, kognitive Umbewertung, Problemlösen, Grübeln, Vermeidung, Unterdrückung des emotionalen Erlebens und Unterdrückung des emotionalen Ausdrucks. Mithilfe von Mehrebenenanalysen mit random Intercepts und fixed Slopes wurden Assoziationen zwischen Emotionsbewertungen zu t und dem Umgang mit Emotionen zu t+3 berechnet. Der Umgang mit

Emotionen wurde als kategoriale Variablen definiert: Regulation versus keine Regulation (Hypothese 1), modifikatorische versus non-modifikatorische Strategien (Hypothese 2) und maladaptive versus adaptive Strategien (Hypothese 3). Demnach sagten die Modelle die Wahrscheinlichkeit für eine Kategorie gegenüber einer alternativen Kategorie vorher. Die Effektstärken wurden anhand von Odds Ratios berechnet.

Ergebnisse

Zu 45% der Messzeitpunkte wendeten Proband:innen keine Regulationsstrategien an. Wenn Strategien eingesetzt wurden, wurde am häufigsten Akzeptanz genutzt (25%), gefolgt von Problemlösen (8%) und Vermeidung (7%). Kognitive Umbewertung wurde zu 2% der Messzeitpunkte angegeben. Wegen der hohen Interkorrelation der Items der Ressourcenbewertungen zur Akzeptanz und Toleranz (siehe Anhang B), wurden diese zu einem gemeinsamen Faktor (Ressourcenbewertungen zur Akzeptanz/Toleranz) gemittelt.

Hypothese 1: Bewertungen der Emotion als schädlicher zum Zeitpunkt t sagten eine erhöhte Wahrscheinlichkeit für die Nutzung von Regulationsstrategien zu t+3 voraus, während für Emotionsvalenz und Emotionsarousal kontrolliert wurde (B = 0.02, SE = 0.00, p < .001, OR = 1.44, 95% CI: 1.30, 1.58).

Hypothese 2: Ressourcenbewertungen zur Modifikation sagten *keine* erhöhte Wahrscheinlichkeit der Nutzung einer modifikatorischen versus einer non-modifikatorischen Strategie vorher (B = 0.01, SE = 0.00, p = .068). Ebenso sagten Ressourcenbewertungen zur Akzeptanz/Toleranz *keine* erhöhte Wahrscheinlichkeit der Nutzung einer non-modifikatorischen gegenüber einer modifikatorischen Strategie vorher (B = -0.01, SE = 0.00, p = .155).

Hypothese 3: Sowohl Emotionsbewertungen als schädlicher (B = 0.01, SE = 0.00, p < .001, OR = 1.20, 95% CI: 1.08, 1.34), als auch Ressourcenbewertungen zur Akzeptanz/Toleranz als unzureichender (B = -0.02, SE = 0.00, p < .001, OR = 0.79, 95% CI: 0.72, 0.87) sagten unabhängig voneinander eine erhöhte Wahrscheinlichkeit für die Nutzung von maladaptiven Regulationsstrategien vorher, während für Emotionsvalenz und Emotionsarousal kontrolliert wurde. Die erwartete Interaktion von Emotionsbewertungen als schädlich und von Ressourcenbewertungen zur Akzeptanz/Toleranz war nicht signifikant (B = 0.00, SE = 0.00, p = .092). Ebenso sagten Ressourcenbewertungen zur Modifikation *keine* erhöhte Wahrscheinlichkeit für die Nutzung adaptiver Strategien vorher (B = 0.00, SE = 0.00, p = .095).

Diskussion

Die Befunde bestätigen die Annahme, dass Bewertungen der eigenen Emotionen als schädlich mit der Anwendung maladaptiver Emotionsregulationsstrategien assoziiert sind. Außerdem konnte gezeigt werden, dass eine Bewertung unzureichender persönlicher Ressourcen die Emotion akzeptieren und aushalten zu können ebenfalls mit der Nutzung maladaptiver Emotionsregulationsstrategien zusammenhängt. Die Effekte fanden sich unabhängig der angegebenen Valenz und des Arousals der Emotionen. Entgegen unserer Annahme zeigte sich keine Interaktion der verschiedenen Emotionsbewertungen. Das heißt, Bewertungen bezüglich adäquater Ressourcen konnten nicht für Emotionsbewertungen als schädlich kompensieren (eine bedrohliche Bewertung in die einer machbaren Herausforderung wandeln). Vielmehr scheinen Bewertungen der Emotion als schädlich und Ressourcenbewertungen zur Akzeptanz/Toleranz Emotionsregulation über unabhängige Pfade zu beeinflussen. Zusammenfassend lässt sich festhalten, dass die Ergebnisse zu einem verbesserten Verständnis von Emotionsregulation im Kontext von psychischen Störungen beitragen. So könnten abweichende Emotionsbewertungen den vermehrten Gebrauch maladaptiver Regulationsstrategien in klinischen Gruppen erklären, die im Labor tatsächlich in der Lage sind adaptive Strategien adäquat anzuwenden. Die Ergebnisse müssen in klinischen Stichproben bestätigt werden. Dann ließe sich für die klinische Praxis ableiten, dass ein verstärkter Fokus auf die Normalisierung emotionalen Erlebens, auf die kognitive Arbeit an automatischen Emotionsbewertungen und Ressourcenbewertungen zur Akzeptanz/Toleranz, maladaptiven Strategien vorbeugen und damit Psychopathologie reduzieren könnte.

3.3 Studie III: Empirische Überprüfung adaptiver Regulationsmuster im Zusammenhang mit paranoiden Gedanken

Wittkamp, M. F., Krkovic, K., & Lincoln, T. M. (2021). An analysis of the pattern of adaptive emotion regulation associated with low paranoid ideation in healthy and clinical samples. *Cognitive Therapy and Research*, *45*(3), 468-479. https://doi.org/10.1007/s10608-020-10173-6

Einleitung

Während der Zusammenhang zwischen maladaptiven Emotionsregulationsstrategien und psychotischer Positivsymptomatik in Studien vielfach bestätigt werden konnte, ist der Forschungsstand in Bezug auf adaptive Regulationsstrategien und psychotische Positivsymptome heterogen (Ludwig et al., 2020). Diese unklaren Befunde stehen allerdings im

Kontrast zu einer Reihe von Studien, die eine Reduktion von Positivsymptomatik durch klinische Interventionen mit dem Fokus auf die Vermittlung von adaptiven Strategien zeigen konnten (Cramer et al., 2016; Louise et al., 2018; Opoka et al., 2018). Eine mögliche Erklärung dafür ist, dass sich die Emotionsregulationsforschung bisher weitestgehend auf Zusammenhänge isoliert betrachteter Regulationsstrategien mit psychotischen Symptomen beschränkt. Experience-Sampling Studien deuten jedoch darauf hin, dass Menschen mehrere Regulationsstrategien im Umgang mit einer Emotion anwenden (Ford et al., 2019). In ihrem Modell des konstruktiven Umgangs mit Gefühlen zeigen Berking und Whitley (2014) auf, wie die Emotionswahrnehmung, Emotionsbenennung und das Emotionsverständnis (hier zusammengefasst als Emotionsverständnis) sowie die mitfühlende Selbstunterstützung die anschließende Modifikation oder Akzeptanz von Emotionen begünstigen. Auf Basis dieses Modells wurde in dieser Studie daher untersucht, ob das Emotionsverständnis und die mitfühlende Selbstunterstützung den negativen Zusammenhang zwischen Modifikation und paranoiden Gedanken (Hypothese 1) und zwischen Akzeptanz/Toleranz und paranoiden Gedanken (Hypothese 2) verstärken.

Methode

Die Hypothesen wurden in einer Studie A im querschnittlichen Design und einer Studie B im längsschnittlichen Design untersucht.

Studie A: Daten einer gemischten Stichprobe wurden genutzt, um das Kontinuum psychotischer Positivsymptome abzubilden. Diese umfasste Daten von Proband:innen mit einer psychotischen Störung ($n = 60$), mit einem Risiko für die Entwicklung einer psychotischen Störung ($n = 25$) und von gesunden Kontrollproband:innen ($n = 40$), die aus einem größeren Projekt zur Untersuchung des Einflusses eines sozialen Ausschlussparadigmas auf psychotische Symptome stammen (DFG: LI 1298/7-1). Adaptive Emotionsregulationsstrategien wurden mit dem Fragebogen zur emotionsspezifischen Selbsteinschätzung emotionaler Kompetenzen (SEK-ES; Ebert et al., 2013) erfasst. Die Erhebung wurde durch ein Interview unterstützt, in dem mehrere Situationen mit bestimmten Emotion fokussiert wurden, für die Proband:innen anschließend den SEK-ES beantworteten. Paranoide Gedanken wurden mithilfe der Paranoia Checkliste (PCL-18; Freeman et al., 2005) erhoben. Es wurden multiple Regressionsmodelle mit den Prädiktoren der einzelnen Regulationsstrategien sowie der Interaktionen zwischen den Strategien des Emotionsverständnisses bzw. mitfühlender Selbstunterstützung und Modifikation bzw. Akzeptanz/Toleranz berechnet.

Studie B: Es wurden Baseline ESM-Daten von Proband:innen mit einem erhöhten Risiko für psychische (u.a. psychotische) Störungen aus einem größeren Projekt zur Überprüfung der Wirksamkeit eines Emotionsregulationstrainings verwendet (siehe Studie IV). Das erhöhte Risiko für die Entwicklung psychischer Störungen war definiert als subklinische Symptombelastung in den Bereichen psychotischer Positivsymptome, Negativsymptome, depressiver Symptome oder Angstsymptome (*N* = 138). Wie in Studie A, wurden die adaptiven Emotionsregulationsstrategien mit dem SEK-ES erfasst. Paranoide Gedanken wurden mit einer verkürzten Version der PCL-18 (Schlier et al., 2016) erhoben. Mithilfe von Time-lagged, Mehrebenen-Regressionsanalysen wurde der Zusammenhang zwischen Emotionsregulationsstrategien zum Messzeitpunkt t und paranoiden Gedanken zum Messzeitpunkt > 1,5 Stunden später (semi-zufällige Abstände; t+1) untersucht. Prädiktoren waren die einzelnen Emotionsregulationsstrategien sowie die Interaktionen zwischen Emotionsverständnis (Mittelwert: Wahrnehmung, Benennung, Verständnis) bzw. mitfühlender Selbstunterstützung und Modifikation bzw. Akzeptanz/Toleranz. Für den Einfluss negativer Emotionen und paranoider Gedanken zu t wurde kontrolliert.

Ergebnisse

Studie A: Die Assoziation zwischen Modifikation und paranoiden Gedanken wurde nicht moderiert vom Emotionsverständnis oder der Selbstunterstützung. Der Zusammenhang zwischen Akzeptanz und paranoiden Gedanken wurde durch das Emotionsverständnis moderiert (*B* = -0.76, *SE* = 0.32, *p* = .019). Lediglich bei Teilnehmenden mit einem guten Emotionsverständnis zeigte Akzeptanz eine negative Assoziation mit paranoiden Gedanken. Außerdem wurde der Zusammenhang zwischen Akzeptanz und paranoiden Gedanken durch die Selbstunterstützung moderiert (*B* = 0.48, *SE* = 0.20, *p* = .019). Genauer waren paranoide Gedanken bei Proband:innen, die entweder eine gute Selbstunterstützung oder eine gute Akzeptanz berichteten, weniger stark ausgeprägt als bei denen, die beide Strategien wenig oder viel nutzten.

Studie B: Der Zusammenhang zwischen Modifikation und paranoiden Gedanken wurde nicht durch das Emotionsverständnis oder Selbstunterstützung moderiert. Allerdings wurde der Zusammenhang zwischen Akzeptanz und paranoiden Gedanken vom Emotionsverständnis moderiert (*B* = -0.12, *SE* = 0.06, *p* = .037). Wenn Proband:innen eine Emotion sowohl adäquat verstanden als auch akzeptierten, verringerte das in der Folge die Wahrscheinlichkeit für paranoide Gedanken im Vergleich zu Situationen in denen das Gefühl nicht adäquat verstanden

wurde. Selbstunterstützung moderierte nicht den Zusammenhang zwischen Akzeptanz und paranoiden Gedanken.

Diskussion

In beiden Studien bestätigt sich, dass das Emotionsverständnis eine wichtige Bedingung für den negativen Zusammenhang zwischen Akzeptanz und paranoiden Gedanken darstellt. Dieser Befund untermauert eine Annahme aus dem Modell des konstruktiven Umgangs mit Gefühlen von Berking und Whitley (2014). Entgegen der Erwartung zeigte sich keine Moderation vom Emotionsverständnis und der Selbstunterstützung auf die Modifikation. Das könnte damit zusammenhängen, dass einige Modifikationsstrategien, wie z.B. das Problemlösen, der Emotion zugrundeliegende Faktoren (z.B. das zugrundeliegende Problem) beeinflussen und damit keine Gefühlserfassung voraussetzen. Um eine Emotion zu akzeptieren, scheint es hingegen wichtiger zu sein, dass die Emotion klar umrissen und verstanden ist. Der Versuch eine unverstandene, diffuse Emotion zu akzeptieren hingegen könnte zu einer passiven Resignation führen (vgl. Garnefski & Kraaij, 2006). Im klinischen Kontext könnte es demzufolge hilfreich sein, Fähigkeiten zur Wahrnehmung, Benennung und zum Verständnis von Emotionen zu vermitteln, um eine adaptive Akzeptanz zu ermöglichen und paranoiden Gedanken entgegenzuwirken.

3.4   Studie IV: Eine randomisiert-kontrollierte Studie zur Überprüfung der Wirksamkeit eines Gruppentrainings der Emotionsregulation in der Prävention

Wittkamp, M. F., Krkovic, K., & Lincoln, T. M. (2022). Efficacy of a transdiagnostic emotion regulation training for people at risk of developing serious mental health problems. [Manuscript submitted for publication]. Institute of Psychology, Universität Hamburg.

Einleitung

Subklinische Psychose-, Depressions- und Angstsymptome beeinflussen sich gegenseitig, sind mit erheblichen Beeinträchtigungen assoziiert und stellen ein Risiko für die Entwicklung manifester Störungen dar (Hartmann et al., 2019; Stochl et al., 2015; van Os, 2013). Emotionsregulation bildet dabei einen transdiagnostischen Faktor, der im Zusammenhang sowohl mit subklinischen als auch klinischen Psychose-, Depressions- und Angstsymptomen steht. Das TEK (Berking, 2008) wurde als transdiagnostische Gruppenintervention zur Verbesserung der Emotionsregulationsfähigkeit konzipiert, die auch in der Prävention angewendet werden kann. Die Wirksamkeit bezüglich der Symptomreduktion konnte bereits in

klinischen Stichproben gezeigt werden (z.B. Berking et al., 2019, 2022). In subklinischen Stichproben finden sich Hinweise auf eine effektive Verbesserung der Emotionsregulation (Berking et al., 2010). Bisher wurde das TEK subklinisch allerdings noch nicht im Hinblick auf Psychopathologie untersucht. Deshalb wurde in dieser Studie die Wirksamkeit des TEK im Hinblick auf die Prävention der Entwicklung psychischer Störungen, der Reduktion allgemeiner Psychopathologie (primäre Ergebnisvariablen) und von Psychose-, Depressions- und Angstsymptomen sowie auf die Verbesserung der Emotionsregulation (sekundäre Ergebnisvariablen) in einer subklinischen Risikostichprobe mit erhöhter Symptombelastung untersucht.

Methode

In einer randomisiert-kontrollierten Studie wurde das TEK mit einer aktiven Kontrollgruppe mit Selbsthilfe-Bibliotherapie verglichen (BT). Einschlusskriterien für die Studienteilnahme waren erhöhte Werte im Bereich psychotischer, depressiver oder ängstlicher Symptome und ein Alter zwischen 18-65 Jahre. Ausschlusskriterien waren die aktuelle Teilnahme an einer Psychotherapie, unzureichende Deutschkenntnisse oder die aktuelle Diagnose einer Achse I- oder Achse II-Störung. Entsprechend wurden N = 138 Teilnehmende mit einem erhöhten Risiko für die Entwicklung einer psychischen Störung den Bedingungen (TEK oder BT) randomisiert zugeteilt. Das TEK ist ein manualisiertes, gruppenbasiertes Training, das darauf abzielt, über wöchentliche Sitzungen (8 Sitzungen à 2,5 h), ein adäquates Verständnis und eine bewertungsfreie Haltung gegenüber Emotionen, Akzeptanz, Selbstunterstützung und Strategien zur Veränderung von Emotionen zu vermitteln. Als aktive Kontrollbedingung wurde das Selbsthilfebuch zur Emotionsregulation „Gefühle im Griff" von Barnow (2018) verwendet. Das Buch beinhaltet ein achtwöchiges Trainingsprogramm mit täglichen Übungen zu den Strategien der kognitiven Umstrukturierung, Akzeptanz, Problemlösen, Grübeln, Gefühlsunterdrückung und Vermeidung. Die primären Ergebnisvariablen waren zum einen die Diagnose einer psychischen Störung 12 Monate nach Ende des TEK, erfasst mit dem Strukturierten Klinischen Interview für DSM-IV (Wittchen et al., 1997) und zum anderen die allgemeine Psychopathologie im Brief Symptom Inventory (BSI; Franke, 2017). Sekundäre Ergebnisvariablen waren psychotische Positiv-, und Negativsymptome gemessen mit dem Community Assessment of Psychic Experiences (CAPE; Stefanis et al., 2002), depressive Symptome gemessen mit dem Beck-Depression Inventory-II (Hautzinger et al., 2009), ängstliche Symptome gemessen mit den State Trait Anxiety Inventory (Laux et al., 1981; Spielberger et al.,

1971) sowie die adaptive Emotionsregulation. Die adaptive Emotionsregulation wurde sowohl habituell erfasst mit dem Fragebogen zur Standardisierten Selbsteinschätzung emotionaler Kompetenzen-27 (SEK 27; Berking & Znoj, 2008), als auch im Alltag mithilfe des SEK-ES und der ESM. Es erfolgten zweiwöchentliche Fragebogen-Messungen im Verlauf und nach Abschluss des Trainings (T1 – T5), ESM Messungen zu T1 und T5 sowie Fragebogen-Messungen nach sechs und zusätzliche Interviews 12 Monate nach Beendigung des Trainings (FU6, FU12; siehe Anhang D). Für die Berechnung der Gruppenunterschiede in Bezug auf Diagnosen im 12-Monats-Follow Up wurden Chi-square Tests berechnet. Für den Vergleich der allgemeinen Psychopathologie sowie der sekundären Ergebnisvariablen wurden Mehrebenen-Wachstumskurvenmodelle mit den Prädiktoren Zeit auf Level 1 und Bedingung auf Level 2 als Moderator mit random Intercepts und random Slopes berechnet, um die Überlegenheit der TEK Bedingung zu testen. Um mit fehlenden Daten umzugehen, wurden Maximum Likelihood Schätzungen angewendet. Des Weiteren wurden Intention to Treat Analysen mit Complete Case Analysen verglichen.

Ergebnisse

In Bezug auf die primäre Ergebnisvariable der diagnostizierten psychischen Störungen zum Follow-Up nach 12 Monaten zeigte sich kein signifikanter Unterschied zwischen der TEK und der BT Bedingung: X^2 (2, 73) = .30, p = .863 (TEK: 19% vs. BT: 24%). Es zeigten sich signifikante Veränderungen über den Verlauf bis nach Abschluss der Intervention zu Messzeitpunkt T5 für alle Variablen, aber keine signifikante Interaktion zwischen Zeit × Bedingung für die primäre Ergebnisvariable der allgemeinen Psychopathologie (B = 0.01, SE = 0.01, p = .515) und die Symptomvariablen sowie Emotionsregulation im retrospektiven Fragebogen. Allerdings zeigte sich eine signifikante Interaktion zugunsten des TEK zwischen Zeit × Bedingung für die Emotionsregulation im ESM (B = 0.39, SE = 0.13, p = .004, d = 0.65).

Diskussion

Während sich das TEK wirksamer für die Verbesserung der Emotionsregulation im Alltag zeigte als eine Selbsthilfe-BT, ließ sich keine Überlegenheit im Hinblick auf die Prävention psychischer Störungen, die Reduktion allgemeiner Psychopathologie und die Reduktion von Symptomen finden. Für die allgemeine Psychopathologie und Psychose-, Depressions- und Angstsymptome zeigte sich zwar eine deutliche Reduktion mit mittleren bis großen Effekten. Eine Wirksamkeit beider Interventionen ließ sich aufgrund der fehlenden Kontrollgruppe ohne Intervention allerdings nicht überprüfen. Demnach ist zunächst nicht von einer hinreichenden Wirksamkeit des TEK auszugehen. Deshalb stellt sich die Frage, wieso sich eine deutlichere

Verbesserung der Emotionsregulation nicht in einer entsprechenden Verbesserung der Psychopathologie übertragen hat. Ein Grund dafür könnte sein, dass der Effekt auf die adaptive Emotionsregulation nicht ausreichend stark und umfassend war. Zukünftige Präventionsstudien mit Risikostichproben könnten ein Emotionsregulationstraining mit verstärktem Fokus auf weitere Komponenten der Emotionsregulation, wie Emotionsbewertungen, untersuchen. Die durchschnittliche Teilnahme an den TEK Sitzungen lag bei 5.5 (*SD* = 2.1) von acht möglichen Sitzungen. Das spricht dafür, dass einige Teilnehmende Schwierigkeiten hatten, regelmäßig an den Sitzungen teilzunehmen. Entsprechend könnte es hilfreich sein das TEK durch eine Smartphone-App zu ergänzen (vgl. Böhme & Berking, 2021), um eine flexiblere Teilnahme zu ermöglichen und somit die Wirksamkeit zu verbessern. Schließlich könnte in zukünftigen Studien untersucht werden, wie eine Ergänzung der Emotionsregulationsintervention durch einen verstärkten Fokus auf kontextuelle Risikofaktoren, wie zum Beispiel Ernährung, Sport und den Arbeitskontext, die Wirkung eines Emotionsregulationstrainings in der Prävention stärken kann.

4. Diskussion und Ausblick

4.1 Implikationen für ein Emotionsregulationsmodell

In der Überprüfung der gerichteten Hypothesen (Studie II) aus dem integrativen Modell der Emotionsregulation (Studie I) bestätigte sich teilweise die erwarteten Zusammenhänge von Emotionsbewertungen und Emotionsregulationsstrategien. Wie erwartet zeigten sich die Assoziationen zwischen Emotionsbewertungen und Emotionsregulation unabhängig des Emotionsarousals. Dieser Befund passt zur Annahme des Modells, dass Emotionsbewertungen je nach Kontext, Lernerfahrung etc. für gleiche Emotionsintensitäten variieren können. Diese variierenden Emotionsbewertungen werden in der Ball-in-Bowl Metapher durch veränderliche Breiten der Färbung in der Schüsselwand illustriert. Um in der Terminologie der Metapher zu bleiben, bestätigte sich zudem die grüne Zone einer Emotionsbewertung als hilfreich, die keinen Regulationsaufwand nach sich zieht. Außerdem festigte sich die rote Zone der Schale, die hektische Auslenkungsversuche begünstigt, um der Gefahr einer aus der Schale schießenden Kugel entgegenzuwirken und damit illustriert, wie Emotionsregulationsbewertungen als schädlich maladaptive Emotionsregulation bei wahrgenommen unzureichenden Regulationsressourcen begünstigt, um unerträgliches Emotionserleben zu vermeiden. Die erwartete Interaktion bestätigte sich jedoch nicht und somit konnte die gelbe Zone einer herausfordernden Emotionsregulationssituation nicht empirisch untermauert werden. Dieses

Ergebnis deutet stattdessen darauf hin, dass Emotionsbewertungen als schädlich und Ressourcenbewertungen der Akzeptanz/Toleranz die Emotionsregulation unabhängig voneinander beeinflussen. Kein Zusammenhang fand sich zwischen Bewertungen persönlicher Ressourcen Emotionen verändern zu können und der anschließenden Emotionsregulation. Dieser Befund ist überraschend, weil das Konstrukt der Ressourcenbewertung zur Modifikation am ähnlichsten zu Überzeugungen über Emotionen bezüglich ihrer Kontrollierbarkeit oder Veränderbarkeit ist, die eine zentrale Rolle im Modell zu Überzeugungen über Emotionen von Ford und Gross (2018) einnehmen, am häufigsten untersucht wurden und hier Zusammenhänge mit Emotionsregulationsstrategien aufzeigten (Kneeland et al., 2016, 2020; Ortner & Pennekamp, 2020). Wichtig in diesem Zusammenhang ist allerdings, dass sich bisherige Untersuchungen auf retrospektive Fragebögen zu allgemeinen Überzeugungen über Emotionen, jedoch nicht auf ESM (State) Messungen von Emotionsbewertungen konzentrierten. Zukünftige Forschung sollte daher zunächst Zusammenhänge zwischen Ressourcenbewertungen zur Modifikation in spezifischen Alltagssituationen und Trait Messungen zu Kontrollüberzeugungen überprüfen, um die Befunde in Verbindung bringen zu können. Zusammenfassend bestätigt sich die im integrativen Modell der Emotionsregulation (Studie I) angenommene Relevanz von Emotionsbewertungen als hilfreich versus schädlich und von Ressourcenbewertungen zur Akzeptanz/Toleranz. Das Konzept von Ressourcenbewertung zur Modifikation von Emotionen hingegen sollte in zukünftigen Studien weiter überprüft werden.

Die Befunde aus Studie III bestätigen das Modell zum konstruktiven Umgang mit Gefühlen von Berking und Whitley (2014) in dem Punkt, dass die Strategien der Emotionswahrnehmung, der Benennung und des Verständnisses von Emotionen (in Studie III zusammengefasst als Emotionsverständnis) einen Einfluss auf die Umsetzung von Akzeptanz und Toleranz haben. Nicht bestätigt wurde dieser Zusammenhang für die Modifikation von Emotionen und es bleibt zu untersuchen, ob dieser Zusammenhang eher einer Mediation als einer Moderation entspricht (vgl. Berking et al., 2012) oder ob modifikatorische Strategien einen unabhängigen Einfluss auf Symptome haben. Der Befund bezüglich der Akzeptanz unterstreicht die Relevanz adaptiver Regulationsmuster gegenüber einzelnen Regulationsstrategien und macht deutlich, dass das Zusammenspiel von Regulationsstrategien in Emotionsregulationsmodellen berücksichtigt werden sollte. Das Zusammenspiel strategiebasierter Regulationsstrategien ist im integrativen Modell der Emotionsregulation (Studie I) bisher nicht explizit ausgeführt. Hier sind Erweiterungen der Ball-in-Bowl Metapher denkbar. Zum Beispiel könnte das Emotionsverständnis metaphorisch in Form der

Wahrnehmung, Benennung und des Verständnisses der Kugel integriert werden, die es erleichtert sich auf die Kugelbewegungen zu fokussieren ohne die Schale zu bewegen. Anstelle einzelner Regulationsstrategien könnte dann das Zusammenspiel adaptiver Regulationsmuster mit den weiteren Komponenten des Modells, wie Emotionsbewertungen oder der psychophysiologischen Selbstregulation im Hinblick auf Emotionsdynamiken untersucht werden. Eine weitere abgeleitete Hypothese aus dem integrativen Modell der Emotionsregulation haben wir bereits untersucht. Hier zeigten sich die erwarteten Zusammenhänge zwischen Emotionsdynamiken und Psychopathologie (Nowak et al., in press). Weitere Untersuchungen zum Zusammenspiel der Komponenten stehen allerdings noch aus, sodass das Modell bisher zum größten Teil theoretisch bleibt und weiter getestet werden muss. In der Zukunft kann das integrative Modell der Emotionsregulation durch empirische Untersuchungen in Aspekten belegt, korrigiert oder erweitert werden und somit einen Rahmen für zukünftige Forschung und die klinische Praxis geben.

4.2 Emotionsregulation und Psychopathologie – Fokus auf psychotische Positivsymptome

Die theoretischen Annahmen aus dem integrativen Modell der Emotionsregulation (Studie I) sowie dessen empirische Bestätigung in Studie II können dazu beitragen bisher unzureichend erklärte Befunde zum Zusammenhang zwischen Emotionsregulation und psychotischen Positivsymptomen zu verstehen. Befunde aus experimentellen Studien und ESM Studien deuten darauf hin, dass Menschen mit einer psychotischen Störung in der Lage sind, adaptive Emotionsregulationsstrategien erfolgreich anzuwenden und darüber negative Emotionen zu reduzieren (Grezellschak et al., 2015; Ludwig et al., 2020; Opoka et al., 2021). Das wirft die Frage auf, aus welchen Gründen Menschen mit psychotischen Störungen trotz dieser Fähigkeiten vermehrt auf maladaptive Strategien zurückgreifen. Unsere Ergebnisse aus Studie II zeigen, dass Emotionsbewertungen als schädlich sowie Ressourcenbewertungen zur Akzeptanz/Toleranz als unzureichend die Nutzung maladaptiver Strategien vorhersagen. Demzufolge könnte die häufige Nutzung maladaptiver Strategien in klinischen Gruppen damit zusammenhängen, dass Menschen mit psychotischen Störungen ihre Emotionen als schädlicher bewerten und sich zudem selbst weniger zutrauen Emotionen akzeptieren/tolerieren zu können. Tatsächlich konnten Yoon et al. (2018) in einer Metaanalyse für Menschen mit Depressionen bestätigen, dass diese größere Angst vor Emotionen haben und sich eine geringere Stresstoleranz zuschreiben als gesunde Kontrollproband:innen. Für Rückschlüsse der Rolle von Emotionsbewertungen für die Nutzung maladaptiver Regulationsstrategien bei Menschen mit

psychotischen Störungen stehen allerdings noch einige Untersuchungen aus: 1) Abweichungen der Emotionsbewertungen wurden noch nicht für Menschen mit psychotischen Störungen untersucht 2) die Befunde aus Studie II müssen in klinischen Stichproben mit Psychose-Symptomen bestätigt werden 3) es lassen sich aus Studie II keine kausalen Rückschlüsse ziehen, weil nicht für einen umgekehrten Effekt der Nutzung von Regulationsstrategien auf die Emotionsbewertung kontrolliert werden konnte. Um hier eine Richtung des Effekts festzustellen, sind experimentelle Studien oder ESM Studien mit der Möglichkeit für Cross-Lagged Analysen notwendig. Auf Basis unserer Befunde lässt sich also zunächst nur vermuten, dass Emotionsbewertungen eine entscheidende Rolle dafür spielen, dass sich Menschen mit psychotischen Störungen für die Nutzung maladaptiver Strategien entscheiden.

Eine Reihe aktueller Befunde deutet darauf hin, dass Schwierigkeiten der Emotionsregulation bei Menschen mit psychotischen Störungen nicht alleine darin liegen, dass sie maladaptive anstelle von adaptiven Strategien anwenden. Stattdessen zeigen sie insgesamt größere Regulationsbemühungen. Während sich in der ESM Studie von Ludwig et al. (2020) bei Menschen mit psychotischen Störungen entsprechend der retrospektiven Fragebogenstudien bestätigte, dass sie maladaptive Strategien, wie Rumination und Unterdrückung, im Vergleich zu gesunden Kontrollproband:innen vermehrt anwendeten, fand sich überraschenderweise auch ein vermehrter Gebrauch von adaptiven Strategien, wie der kognitiven Umbewertung. In weiteren ESM Studien zeigte sich außerdem, dass Menschen mit psychotischen Störungen bereits bei einem geringeren Intensitätslevel von Emotionen regulieren und deutlich höhere Regulationsbemühungen aufweisen als gesunde Kontrollproband:innen (Raugh & Strauss, 2021; Visser et al., 2018). Eine Erklärung für diese Befunde könnten unsere Ergebnisse aus Studie II liefern, dass Emotionsbewertungen als schädlicher unabhängig von der Emotionsvalenz und des Emotionsarousals zu vermehrten Regulationsbemühungen führten. Eine aktuelle ESM Studie weist zudem darauf hin, dass Menschen mit psychotischen Störungen, verglichen mit gesunden Kontrollproband:innen, häufiger zwischen Regulationsstrategien wechseln und die Nutzung von Regulationsstrategien später beenden (Bartolomeo et al., 2022). Diese Ergebnisse passen zur theoretischen Annahme aus Studie I, dass sich eine maladaptive Emotionsregulation dadurch äußert, dass Menschen hektisch und beharrlich versuchen eine Emotion zu beenden. Diese verzögerte Beendigung der Regulationsbemühungen wurde in der Studie von Bartolomeo et al. moderiert durch die Selbstwirksamkeitserwartung, die konzeptuell Ähnlichkeiten mit Bewertungen der Regulationsressourcen (Studie II) aufzeigen. Basierend auf diesen und unseren Befunden lässt sich demnach vermuten, dass Menschen mit psychotischen Störungen

versuchen, mit dem andauernden Einsatz einer Vielzahl von Strategien, für sie schädliche und überfordernde Emotionen nicht erleben zu müssen. Für zukünftige Studien wäre es demnach interessant zu untersuchen, ob Menschen mit psychotischen Störungen ihre Emotionen tatsächlich als schädlicher und ihre Ressourcen zur Akzeptanz/Toleranz als unzureichender bewerten als Menschen ohne psychische Störungen und ob diese Emotionsbewertungen ihre früheren, verstärkten und anhaltenderen Emotionsbemühungen erklären können.

Unsere Ergebnisse aus Studie III können dazu beitragen inkonsistente Zusammenhänge zwischen adaptiven Strategien und Psychopathologie zu erklären. In Studie III bestätigt sich, dass ein Zusammenspiel verschiedener Strategien adaptive Regulationsmuster ausmacht, die einzelnen Strategien überlegen sind. Die Interaktion zwischen Emotionsverständnis und Akzeptanz im Zusammenhang mit paranoiden Gedanken zeigt, dass zu einer adaptiven Akzeptanz mehrere Schritte gehören und die isolierte Betrachtung der Akzeptanzstrategie nicht ausreicht. Unklar bleibt allerdings, ob das aufgezeigte adaptive Regulationsmuster lediglich adaptiv im Hinblick auf paranoide Gedanken oder transdiagnostisch wirksam ist. Für eine spezifische Relevanz des Emotionsverständnisses für paranoide Gedanken sprechen Studien, die Emotionswahrnehmung als Moderator zwischen negativen Emotionen und paranoiden Gedanken zeigen konnten (z.B. Ludwig et al., 2019) sowie solche die eine geringere Emotionswahrnehmung bei Menschen mit Psychosen oder einem erhöhten Risiko für Psychosen im Vergleich zu gesunden Kontrollproband:innen fanden (Kimhy et al., 2012, 2016; van Rijn et al., 2011). Allerdings fehlen bisher systematische Vergleiche zwischen Patient:innengruppen mit verschiedenen Störungsbildern, um Aussagen über Unterschiede in Regulationsmustern treffen zu können (vgl. Lincoln et al., 2022). Deshalb wäre es wichtig in zukünftigen Studien zu untersuchen, ob das adaptive Regulationsmuster aus Emotionsverständnis und Akzeptanz auch für weitere Psychopathologie, wie Depressions- und Angstsymptome relevant sein könnte.

Während Studie III Aufschluss über Assoziationen adaptiver Regulationsmuster und paranoider Gedanken gibt, überprüften wir in Studie IV inwieweit eine experimentelle Manipulation adaptiver Emotionsregulatoin durch das TEK allgemeine Psychopathologie, psychotische Positiv- und Negativsymptome sowie Depressions- und Angstsymptome kausal beeinflusst. Während sich tatsächlich eine Verbesserung im Vergleich zur aktiven Kontrollgruppe mit BT in der adaptiven Emotionsregulation im Alltag zeigte, konnten wir keine Überlegenheit der TEK Bedingung im Hinblick auf die Verbesserung der allgemeinen Psychopathologie und Symptome feststellen. Eine erfolgreiche Manipulation der adaptiven Regulationsmuster durch das TEK führte demnach nicht zur erwarteten Überlegenheit in der

Symptomverbesserung. Dieses Ergebnis ist überraschend vor dem Hintergrund einer breiten Evidenz dafür, dass Verbesserungen in der Emotionsregulation mit Reduktionen in der Psychopathologie assoziiert sind (für eine Metaanalyse, siehe Daros et al., 2021; für ein Review, siehe Sloan et al., 2017). Der Befund wirft zudem die Frage auf, ob bestimmte Bedingungen nicht gegeben waren, die eine Verbesserung der Psychopathologie ermöglicht hätten. Eine explorative Analyse in Studie IV zeigte keine Überlegenheit des TEK gegenüber der BT in Bezug auf die Anwendung der maladaptiven Strategie Emotionsunterdrückung. Entsprechend ist denkbar, dass weitere Komponenten der Emotionsregulation, wie beispielsweise die Emotionsbewertungen, nicht ausreichend verbessert wurden, um maladaptive Emotionsregulationsbemühungen zu verringern und einen größeren Effekt auf die Psychopathologie zu erzielen.

In Bezug auf belastende psychotische Positivsymptome ist es nicht außergewöhnlich, dass Studie IV keinen Effekt zeigte. Einige Interventionen mit Emotionsregulations-Fokus in klinischen Stichproben mit psychotischen Störungen oder Psychoserisiko zeigten auch keine eindeutigen Effekte auf psychotische Positivsymptome (Mehl et al., 2021; Myin-Germeys et al., 2022). In der Überzahl der Präventionsstudien für psychotische Störungen fand sich zudem keine Überlegenheit spezifischer Präventionsprogramme über verschiedene Kontrollbedingungen (Fusar-Poli et al., 2019; Myin-Germeys et al., 2022; van der Gaag et al., 2019). Vielmehr weisen die Ergebnisse aus Studie IV sowie weiterer Studien auf eine parallele Reduktion der Symptombelastung in der Interventions- und der Kontrollbedingung hin (Wilson et al., 2020). Diese führen Myin-Germeys et al. (2022) darauf zurück, dass bereits der Kontakt zum Studienteam und die eigene Beobachtung der Symptome Belastung reduzieren könnten. In Studie IV reichte der gemessene Effekt auf die Regulationsfähigkeiten demnach nicht aus, um über den von Myin-Germeys et al. beschriebenen typischen Verlauf hinaus einen Effekt auf psychotische Positivsymptome zu erzielen. Demnach könnte ein stärkerer und umfassenderer Effekt auf die verschiedenen Komponenten (mal)adaptiver Emotionsregulation notwendig sein, damit sich dieser auf die Psychopathologie überträgt.

In Studie IV zeigte sich auch keine Überlegenheit des TEK gegenüber BT in Bezug auf die Prävention psychischer Störungen zwölf Monate nach Beendigung des Trainings. Die meisten Teilnehmenden mit einer psychischen Störung (n = 16) berichteten den Übergang in eine depressive Episode (n = 12). Das entspricht einer Inzidenz von 16% und liegt damit im Bereich der Inzidenzen für Depressions-Präventionsprogramme in Risikostichproben (2% - 21%; für ein Review, siehe Munoz et al., 2010). Des Weiteren ließ sich über beide Bedingungen hinweg eine

signifikante Reduktion depressiver Symptome über das Training beobachten, die bis zum 12-Monate Follow-Up anhielt. Diese Ergebnisse könnten darauf hinweisen, dass das TEK und die BT eine höhere Übergangsrate für depressive Störungen verhindert haben. Allerdings lässt sich diese Annahme aufgrund der fehlenden dritten Bedingung ohne Intervention nicht überprüfen. Eine weitere Erklärung könnte sein, dass das TEK unterschiedlich für verschiedene Teilnehmende gewirkt hat. Eine explorative Analyse zeigte keine signifikanten Unterschiede zwischen der Häufigkeit der Teilnahme an Gruppensitzungen in der ART Bedingung zwischen Teilnehmenden, die eine Diagnose zu FU12 entwickelten und denjenigen ohne Diagnose zu FU12 (siehe Anhang D). Allerdings zeigten sich signifikant höhere Werte der allgemeinen Psychopathologie und der Depressionssymptome zur Baseline bei Teilnehmenden, die eine Diagnosen zu FU12 entwickelten im Vergleich zu denjenigen ohne Diagnose zu FU12 (siehe Anhang D). Diese explorativen Befunde deuten darauf hin, dass das TEK für einen Teil der Teilnehmenden mit einer höheren Vulnerabilität, gekennzeichnet durch eine höhere psychische Belastung, nicht ausreichend war. Dies unterstreicht die Vermutung, dass ein stärkerer und umfassenderer Effekt auf die Emotionsregulation notwendig sein könnte, um in einer belasteten Stichprobe Psychopathologie zu reduzieren und Störungen präventiv vorzubeugen.

4.3 Adaptive Emotionsregulation – Fokus auf Akzeptanz

Im integrativen Modell der Emotionsregulation (Studie I) wurde adaptive Emotionsregulation als ein Zusammenspiel zwischen psychophysiologischer Selbstregulation, strategiebasierter Emotionsregulation und Emotionsbewertungen konzeptualisiert, das sich günstig auf Emotionsdynamiken und darüber protektiv gegen Psychopathologie auswirkt. In Studie II bestätigte sich, dass Emotionsbewertungen als hilfreich die Anwendung adaptiver Regulationsstrategien begünstigen. Darüber hinaus erhöhten Ressourcenbewertungen Emotionen akzeptieren/tolerieren zu können als ausreichend die Wahrscheinlichkeit für die Anwendung adaptiver Strategien. Auffällig war, dass Akzeptanz in Studie II mit 25% die am häufigsten angewendete Regulationsstrategie war. Dieser Befund deckt sich mit anderen ESM Studien (Heiy & Cheavens, 2014; Lennarz et al., 2018) und unterstreicht die Relevanz von Akzeptanz als Regulationsstrategie im Alltag. Im Mittel wurden Emotionsbewertungen unmittelbar vor der Nutzung von Akzeptanz deskriptiv am hilfreichsten und persönliche Ressourcen Emotionen akzeptieren/tolerieren zu können am angemessensten angegeben, verglichen mit Bewertungen vor der Anwendung der weiteren Regulationsstrategien. Ein Grund

für den hochfrequenten Gebrauch von Akzeptanz in Studie II könnten demnach im Mittel günstige Emotionsbewertungen darstellen.

Unsere Annahme von Studie II, dass Bewertungen von Ressourcen Emotionen akzeptieren/tolerieren zu können eine höhere Wahrscheinlichkeit für die Nutzung von Akzeptanz gegenüber der kognitiven Umbewertung und dem Problemlösen vorhersagen würde, bestätigte sich nicht. Stattdessen prädizierte eine positivere Emotionsvalenz und ein niedrigeres Emotionsarousal die Nutzung von non-modifikatorischen gegenüber modifikatorischen Strategien. Dieses Ergebnis passt zu Studien, die eine Anwendung von Akzeptanz vor allem bei Emotionen mit niedrigerer Intensität beobachteten (Lennarz et al., 2019). Ein Grund für die häufigere Nutzung von Akzeptanz im Vergleich zur kognitiven Umbewertung (2%) in Studie II könnte demnach sein, dass die ESM viele Situationen mit geringerer Emotionsintensität erfasste und damit kognitive Umbewertung, die mit hohem kognitivem Aufwand verbunden ist (Tamir, 2020), eine weniger attraktive Option darstellte als Akzeptanz. Diese Annahme deckt sich auch mit der Auffassung, dass der Nutzen von Akzeptanz unter anderem darin liegt, der Verschwendung kognitiver Kapazitäten vorzubeugen (vgl. Hofmann & Asmundson, 2008).

Die uniforme Adaptivität von Akzeptanz steht dadurch in Frage, dass sich negative Assoziationen mit Psychopathologie für einige Störungsbilder, wie die Posttraumatische Belastungsstörung und Psychosen nicht robust zeigen lassen (für Metaanalysen, siehe Ludwig et al., 2019; Seligowski et al., 2015). Diese widersprüchlichen Befunde könnten damit zusammenhängen, dass sich die Konzeptualisierung von Akzeptanz in Studien stark unterscheidet. Die Akzeptanz von Situationen weist beispielsweise geringere Zusammenhänge mit Psychopathologie auf als die Akzeptanz von Emotionen (für ein Review, siehe Ford et al., 2018). In ihrem Review zeigen Ford et al. (2018) darüber hinaus, dass sich Akzeptanz vom Konstrukt der Achtsamkeit unterscheidet und einen separaten Faktor mit einem unabhängigen Effekt auf die psychologische Gesundheit darstellt. Auch eine konzeptuelle Unterscheidung zum passiven „Nichts-Tun" ist entscheidend, um Akzeptanz zu untersuchen: Akzeptanz läuft häufig implizit ab (vgl. Braunstein et al., 2017) und kann somit möglicherweise ohne expliziten Hinweis (z.B. durch ESM-Fragen) in vielen Situationen nicht vom passiven „Nichts-Tun" unterschieden werden. Die Option des Nicht-Regulierens ist in einem Großteil der Studien nicht explizit aufgeführt (für eine Ausnahme, siehe Studie II), was dazu beitragen könnte, dass Teilnehmende diese mit einer Akzeptanz von Emotionen verwechseln. Die Ergebnisse von Studie III deuten darauf hin, dass sich eine adaptive, aktive Anwendung von Akzeptanz durchaus unterscheidet von einem passiven „Nichts-Tun". Genauer zeigte sich, dass Akzeptanz nur dann adaptiv im

Hinblick auf das Auftreten paranoider Gedanken war, wenn die Akzeptanz von einem angemessenen Emotionsverständnis begleitet wurde. Dieser Befund passt zu der Konzeptualisierung von Akzeptanz in der ACT von Hayes et al. (1999). Hier wird Akzeptanz als Offenheit und Bereitschaft definiert, eine (unangenehme) Emotion vollständig zu erleben ohne zu versuchen diese zu kontrollieren oder zu vermeiden. Akzeptanz ohne ein ausreichendes Emotionsverständnis hingegen war in Studie III nicht adaptiv in Bezug auf paranoide Gedanken. Demnach lässt sich spekulieren, dass Akzeptanz ohne ausreichendes Emotionsverständnis eher einer Resignation oder einem „Nichts-Tun" gleicht (vgl. Garnefski & Kraaij, 2006). Westermann und Lincoln (2011) fanden in einer subklinischen Stichprobe querschnittlich sogar einen positiven Zusammenhang zwischen Akzeptanz und paranoiden Gedanken. Sie erklärten sich dieses unerwartete Ergebnis so, dass ein paranoider Gedanke selbst eine maladaptive Strategie darstellen könnte, mithilfe dessen eine Erklärung für das emotionale Erleben generiert wird, die wiederum dessen Akzeptanz erleichtert. Die Ergebnisse aus Studie III könnten demnach darauf hinweisen, dass ein realistisches Verständnis einer Emotion die Akzeptanz der Emotion soweit begünstigt, dass dieses Verständnis alternativen Erklärungen der Emotionen durch paranoide Gedanken vorbeugt. Zusammenfassend sprechen die Ergebnisse aus Studie III dafür, dass Akzeptanz nur unter der Bedingung adaptiv gegenüber paranoiden Gedanken ist, dass Emotionen angemessen verstanden werden. Somit können die Ergebnisse dazu beitragen die Heterogenität der Befunde für Akzeptanz und psychotische Positivsymptome zu erklären.

Ein unzureichendes Verständnis einer Emotion könnte wiederum durch Emotionsbewertungen begründet sein. Karnaze und Levine (2018) konnten passend zu unseren Befunden (Studie II) zeigen, dass Emotionsbewertungen als schädlich maladaptive Strategien vorhersagten. Sie erklärten sich den Befund so, dass sich Menschen mit Emotionsbewertungen als schädlich einer Emotion weniger zuwendeten, was das Emotionsverständnis verhindern und damit die Anwendung adaptiver Strategien erschweren würde. Im Einklang mit unserem Ergebnis (Studie II) bezüglich der Bewertungen von Ressourcen eine Emotion akzeptieren/tolerieren zu können, fanden Naragon-Gainey et al. (2017), dass eine erhöhte Stresstoleranz positiv mit Akzeptanz und negativ mit Emotionsvermeidung und Grübeln assoziiert war. Vor dem Hintergrund der Studienbefunde und unserer Ergebnisse aus Studie II lässt sich also vermuten, dass Emotionsbewertungen ein Emotionsverständnis dadurch erschweren könnten, dass Menschen nicht gewillt sind oder es sich nicht zutrauen sich einer Emotion entsprechend zuzuwenden. Zusammengenommen geben die Befunde aus den Studien II und III Hinweise auf einen adaptiven Prozess der Akzeptanz, der durch Emotionsbewertungen

als hilfreich, Ressourcenbewertungen bezüglich Akzeptanz/Toleranz sowie ein angemessenes Verständnis einer Emotion begünstigt wird.

4.4 Implikationen für die klinische Praxis

Aus Studie II lässt sich ableiten, dass Emotionsbewertungen als schädlich sowie Bewertungen persönlicher Ressourcen eine Emotion akzeptieren/tolerieren zu können, relevante Ansatzpunkte bieten, um einem „zu viel" an maladaptiven Strategien entgegenzuwirken. Die erwartete Interaktion von Emotionsbewertungen und Ressourcenbewertungen konnte nicht bestätigt werden. Deshalb sollten sowohl Emotions-, als auch Ressourcenbewertungen adressiert werden. Erste Studien konnten zeigen, dass Überzeugungen über Emotionen in psychotherapeutischen Interventionen erfolgreich verändert werden können (De Castella et al., 2015; Glisenti et al., 2022; Reffi et al., 2020). Die Erfassung von Emotionsbewertungen in spezifischen Situationen (Studie II) legt zudem nahe, dass es automatische Gedanken in Bezug auf Emotionen gibt, die mit Techniken aus der kognitiven Therapie identifiziert, überprüft und kognitiv disputiert werden können (vgl. Beck & Carlson, 2006; Ellis, 1995). Ebenso kann zum Beispiel über Verhaltensexperimente (vgl. Hoyer & Niermann, 2021) daran gearbeitet werden, sich der eigenen Fähigkeiten bewusst zu werden Emotionen akzeptieren und aushalten zu können und damit Einschätzungen persönlicher Ressourcen langfristig zu verändern. Wenn sich bestätigt, dass Emotionsbewertungen im Alltag mit allgemeinen Einstellungen gegenüber Emotionen assoziiert sind, könnte auch eine Psychoedukation über Emotionen hilfreich sein, um diese zu verändern. Die Entstehung von Emotionsbewertungen ist bisher noch unzureichend erforscht. Denkbar ist, dass Faktoren wie Modelllernen, Erfahrungen von Abwertung für emotionales Erleben, emotionaler Missbrauch und traumatische Erlebnisse zur Entstehung ungünstiger Emotionsbewertungen beitragen. Sobald zukünftige Forschung hier mehr Klarheit geschaffen hat, könnte auch die Arbeit an diesen Entstehungsfaktoren einen Ansatzpunkt für Interventionen darstellen. Zusammengenommen deuten die dargestellten Befunde darauf hin, dass neben einem Training zur Umsetzung von Regulationsstrategien auch Emotionsbewertungen berücksichtigt werden sollten. Zudem implizieren die Befunde, dass eine normalisierende anstelle einer pathologisierenden Haltung von Praktiker:innen gegenüber emotionalem Erleben eine hilfreiche Grundlage für die Arbeit an der Emotionsregulation bietet.

Die Ergebnisse aus Studie III machen deutlich, dass für eine – im Hinblick auf paranoide Gedanken – adaptive Akzeptanz ein ausreichendes Emotionsverständnis entscheidend ist. Für

eine Verbesserung der Emotionsregulation bei Menschen mit psychotischen Störungen oder mit erhöhtem Risiko für Psychosen könnte es besonders wichtig sein, das Emotionsverständnis zu adressieren, weil sich hier im Vergleich zu gesunden Kontrollgruppen Schwierigkeiten zeigen (Kimhy et al., 2012, 2016; van Rijn et al., 2011). Dementsprechend könnte zunächst ein Fokus auf die Vermittlung von Fähigkeiten Emotionen wahrzunehmen, zu benennen und deren Ursache zu verstehen entscheidend sein, um anschließend eine adaptive Akzeptanz zu ermöglichen. Klinische Ansätze bilden hier zum Beispiel die Mindful Awareness in Body-Oriented Therapy (MABT; Price & Hooven, 2018), in der eine verbesserte Wahrnehmung von Emotionen als Voraussetzung für eine adaptive Emotionsregulation über eine Stärkung interozeptiver Fähigkeiten geschaffen werden soll.

Das TEK wird bereits einigen Implikationen basierend auf den theoretischen Annahmen aus Studie I und auf den Befunden aus Studie II und III gerecht. So wird die Förderung psychophysiologischer Selbstregulation durch praktische Übungen zu Progressiver Muskelrelaxation (vgl. Jacobson, 1987) und Atementspannung mit Übungen zu strategiebasierten Emotionsregulation verbunden. In der vorangehenden Psychoedukation wird vermittelt, dass Emotionen vorübergehende Phänomene sind, die sich ohne die Anwendung aufrechterhaltender Regulationsstrategien psychophysiologisch selbst regulieren. Emotionsbewertungen werden implizit über eine Psychoedukation zu Emotionen und deren hilfreichen Funktionen sowie über Übungen zur bewertungsfreien Wahrnehmung von Emotionen adressiert. Die bewertungsfreie Wahrnehmung wird im Zusammenhang mit der Benennung und dem Emotionsverständnis auch als Voraussetzung für die Akzeptanz von Emotionen als adaptives Regulationsmuster trainiert.

Basierend auf den Ergebnissen von Studie IV ist dennoch zu überlegen wie ein Emotionsregulationstraining effektiver in der Prävention von psychischen Störungen in transdiagnostischen Risikogruppen werden kann. Um eine flexiblere Teilnahme zu ermöglichen, könnte ein Gruppentraining der Emotionsregulation im Rahmen eines „Blended Care" Ansatzes erweitert werden durch den Einsatz einer Smartphone App. Diese wurde mittlerweile beispielsweise für das TEK entwickelt (Böhme & Berking, 2021). Weil die gemessene Verbesserung der adaptiven Regulationsfähigkeiten durch das TEK nicht ausreichte, um Psychopathologie entscheidend zu reduzieren, sollte weitere Komponenten adaptiver und maladaptiver Regulationsprozesse stärker berücksichtigt werden. So bietet sich beispielsweise ein stärkerer Fokus auf die Identifikation und Veränderung von Emotionsbewertungen an, um der Nutzung maladaptiver Strategien vorzubeugen und darüber Psychopathologie signifikant zu

reduzieren. Ebenfalls denkbar ist, dass sich die Teilnehmenden der Studie IV individuell unterschieden bezüglich der spezifischen Schwierigkeiten mit einzelnen Komponenten der Emotionsregulation (vgl. Studie I). Eine individuelle Identifikation und gezielte Interventionen für bestimmte Komponenten der Emotionsregulation könnte deshalb wirksamer sein, als der „one-size fits all" Ansatz des TEK. Hier könnte sich als Ergänzung zum Gruppentraining der Einsatz von Ecological Momentary Interventions als Alltags-Interventionen auf dem Smartphone anbieten (Balaskas et al., 2021). Diese könnten ermöglichen, die individuellen Probleme der Emotionsregulation im Alltag zu erfassen (z.B. Schwierigkeiten der psychophysiologischen Selbstregulation, ungünstige Emotionsbewertungen, Schwierigkeiten der Benennung und des Verständnisses von Emotionen, abweichende Emotionsdynamiken), um dann personalisierte Unterstützung anzubieten (z.B. alternative Emotionsbewertungen, Hilfestellungen zur Benennung und dem Verständnis von Emotionen). In diesem Zusammenhang wäre auch eine Verwendung der Ball-in-Bowl Metapher möglich, um eine individuelle, maladaptive Emotionsregulation zu veranschaulichen. Zudem könnten, über physiologische Messungen im Alltag, Schwierigkeiten der psychophysiologischen Selbstregulation erfasst werden, die sich dann über Ansätze, wie Entspannungsübungen, Sport und Biofeedback (Goessl et al., 2017; Salmon, 2001; Varvogli & Darviri, 2011), adressieren ließen.

Arango et al. (2018) unterscheiden in ihrem Review zwischen Indikationen für die universelle (Allgemeinbevölkerung), selektive (Risikogruppen durch genetische, psychologische oder soziale Faktoren) und die indizierte (Risikogruppen durch Symptombelastung unterhalb der diagnostischen Schwelle) Primärprävention. Während sie für universelle und selektive Präventionsprogramme die Stärkung von Ressourcen mit niedrigem Risiko für Nebenwirkungen (z.B. Stigmatisierungen) empfehlen, argumentieren Arango et al., dass Ansätze in der indizierten Primärprävention mit einem gewissen Risiko verbunden sein dürfen. Dafür empfehlen sie sowohl eine Stärkung bestimmter Fähigkeiten (vgl. Emotionsregulation) als auch eine Veränderung bestimmter kontextueller Risikofaktoren, wie beispielsweise ungesunde Ernährung, mangelnde Bewegung und eine stressige Arbeitsatmosphäre. Für das Ziel, stärker belastete Menschen vor dem Übergang in eine psychische Störung zu schützen, ist dementsprechend wünschenswert eine Balance zu finden, in der sowohl Vorteile niedrigschwelliger Interventionen mit Emotionsregulationsfokus genutzt werden (z.B. Normalisierung des emotionalen Erlebens), als auch ein gewisses Risiko für Nebenwirkungen eingegangen wird (z.B. psychische Belastung durch die Beschäftigung mit dem eigenen Risiko für die Entwicklung psychischer Störungen). Sowohl ein stärkerer Fokus auf maladaptive

Regulationsstrategien (z.B. Sorgen, Grübeln, Emotionsvermeidung), als auch psychoedukative Elemente und Interventionen zu kontextuellen Risikofaktoren könnten in der Primärprävention für transdiagnostische Risikogruppen demnach eine sinnvolle Erweiterung zur Stärkung der adaptiven Emotionsregulation darstellen und zu einer Linderung der psychischen Belastung beitragen.

4.5   Limitationen

Die theoretischen Überlegungen und die empirischen Befunde der vorliegenden Dissertation müssen neben den genannten Einschränkungen vor dem Hintergrund der folgenden Limitationen interpretiert werden. In Studie I ist die Zuordnung der Komponenten der Ball-in-Bowl Metapher zu Komponenten der Emotionsregulation (z.B. strategie-basierte Emotionsregulation, Emotionsbewertungen) willkürlich gewählt und eine alternative Zuordnung ist denkbar. Zudem fokussiert sich das Modell auf bestimmte Komponenten der Emotionsregulation, während andere relevante Elemente bisher ausgespart wurden (z.B. automatische Emotionsregulation; Mauss et al., 2007; interpersonelle Emotionsregulation; Zaki & Williams, 2013). Die Studien II und III B gingen mit den Herausforderungen einer ökonomischen Erfassung von Konstrukten im ESM einher. Die begrenzte Anzahl an Items war möglicherweise mit der Limitation eingeschränkter psychometrischer Qualität verbunden. Allerdings sprechen die Interkorrelationen zwischen den Items in Studie II für eine ausreichende Validität (siehe Anhang B) und die SEK-ES Items wiesen gute interne Konsistenzen in einer Validierungsstudie auf (Ebert et al., 2013). Ein gängiges Problem von ESM Studien liegt zudem darin, dass die Teilnehmenden durch ESM-Items in ihrem Emotionsregulationsverhalten beeinflusst werden können. So ist für Studie II denkbar, dass ein Item zur Bewertung von Emotionsregulations-Ressourcen ein stärkeres Bewusstsein für die persönlichen Regulations-Ressourcen geschaffen hat. In Studie III könnte die Erfassung von Emotionen zu einem besseren Emotionsverständnis beigetragen haben. Somit ist für die Interpretation der Ergebnisse wichtig zu berücksichtigen, dass die Invasivität der ESM untersuchte Zusammenhänge verzerrt haben könnte. Zudem ist denkbar, dass Teilnehmende in Studie IV durch das Experience-Sampling Assessment in der Emotionsregulation geschult wurden. Während sich das Experience-Sampling Assessment zur Baseline in beiden Studienbedingungen (TEK, BT) nicht unterschied, könnte der Effekt der ESM Zeiteffekte über das Training in beiden Bedingungen verstärkt haben. Außerdem könnten Schwierigkeiten der Emotionswahrnehmung und Benennung, die in Stichproben mit Psychosen und Psychoserisiko festgestellt wurden (Kimhy et al., 2012; van Rijn et al., 2011), Angaben über

diskrete Emotionen im ESM in Studie B beeinflusst haben. Für zukünftige Studien könnte daher eine alternative Erfassung, z.B. mithilfe von Emotionsvalenz und Emotionsarousal hilfreich sein (vgl. Studie II; Wilhelm & Schoebi, 2007). Eine weitere Herausforderung von ESM Studien liegt in den zeitlichen Abständen der Messzeitpunkte. In Studie II verwendeten wir ein neues Design mit einem Zeitintervall von 3 Minuten zwischen t und t+3. Dieser Zeitabstand könnte für einige Teilnehmende für die Emotionsregulation möglicherweise zu kurz oder lang gewesen sein. Um tatsächliche Zeitverläufe von Emotionsregulationsprozessen besser einschätzen zu können und damit optimale ESM Designs zu ermöglichen, bedarf es weiterer empirischer Untersuchungen. In den Studien II, III und IV waren die Stichproben überwiegend weiblich, was vor dem Hintergrund von Geschlechtsunterschieden bei der Emotionsregulation (vgl. Nolen-Hoeksema, 2012) die untersuchten Assoziationen verzerrt haben könnte. Eine Analyse mit Geschlecht als Kontrollvariable veränderte die Hauptergebnisse allerdings nicht. Außerdem wies das Konstrukt der paranoiden Gedanken in Studie III B eine schiefe Verteilung auf und musste nachträglich dichotomisiert werden, was mit einem Informationsverlust einhergeht (vgl. Schlier et al., 2016). Studie IV hatte die Limitation einer fehlenden Kontrollgruppe ohne Intervention. Somit konnten wir nicht für unspezifische Effekte, wie Regression zur Mitte und spontane Remission kontrollieren. Außerdem gab es eine relevante Anzahl an Teilnehmenden, die vorzeitig aus der Studie ausstiegen (16% in der TEK, 11% in der BT Bedingung; zwischen T1 – T5). Bis zur Messung FU12 stiegen weitere Teilnehmende aus (9% in der TEK, 22% in der BT Bedingung). Für den Umgang mit fehlenden Werten wurden Mehrebenenanalysen gerechnet sowie Intention to Treat mit Comple Case Analysen verglichen. Dennoch ist für die Interpretation der Ergebnisse wichtig zu berücksichtigen, dass nicht von allen Proband:innen vollständige Datensätze vorlagen.

4.6 Fazit

Das vorliegende Dissertationsprojekt trägt über konzeptuelle Überlegungen und empirische Untersuchungen zu einem verbesserten Verständnis adaptiver und maladaptiver Regulationsprozesse bei. Theoretisch gibt das integrative Modell der Emotionsregulation (Studie I) einen Rahmen für zukünftige Forschung zu (mal)adaptiver Emotionsregulation als Zusammenspiel der Komponenten strategiebasierter Emotionsregulation, psychophysiologischer Selbstregulation und Emotionsbewertungen sowie ihrem Einfluss auf Emotionsdynamiken und Psychopathologie. Empirisch bestätigen die Studien (II, III, IV), dass eine isolierte Betrachtung der Frequenz und Fähigkeit zur Umsetzung einzelner

Emotionsregulationsstrategien nicht ausreicht, um (mal)adaptive Emotionsregulation zu verstehen. Stattdessen deuten die Befunde aus Studie II darauf hin, dass Emotionsbewertungen sowie Ressourcenbewertungen zur Akzeptanz/Toleranz entscheidend mit der Nutzung von Emotionsregulationsstrategien zusammenhängen. Außerdem legen die Ergebnisse aus Studie III nahe, dass Akzeptanz nur unter der Bedingung adaptiv wirkt, dass die entsprechenden Emotionen angemessen verstanden werden. In Studie IV hatte eine erfolgreiche Verbesserung der Emotionsregulationsfähigkeiten keine signifikanten Effekte auf die Psychopathologie und die Prävention psychischer Störungen. Um Interventionen mit einem Fokus auf die Emotionsregulation langfristig verbessern zu können, ist demnach ein differenzierteres Verständnis (mal)adaptiver Emotionsregulation notwendig, das die genannten Komponenten miteinbezieht. Für zukünftige Studien wäre es relevant zu untersuchen, ob Menschen mit psychischen Störungen ihre Emotionen schädlicher und ihre Ressourcen zur Akzeptanz/Toleranz von Emotionen als unzureichender bewerten als Menschen ohne psychische Störungen und ob sich damit verstärkte maladaptive Regulationsbemühungen in klinischen Gruppen erklären lassen. Zudem wäre es wichtig, zu überprüfen, ob das adaptive Muster aus Emotionsverständnis und Akzeptanz protektiv gegenüber verschiedenen Symptomgruppen ist. Wenn sich die erwarteten Zusammenhänge bestätigen, könnte eine gezielte therapeutische Arbeit an Emotionsbewertungen sowie eine normalisierende Haltung gegenüber Emotionen und die Vermittlung adaptiver Muster der Akzeptanz relevante Bestandteile von Interventionen darstellen, um Psychopathologie wirksamer reduzieren und vorbeugen zu können.

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Using the Ball-in-Bowl Metaphor to Outline an Integrative Framework for Understanding Dysregulated Emotion

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Dysregulated emotion plays an important role for mental health problems. To elucidate the underlying mechanisms, researchers have focused on the domains of strategy-based emotion regulation, psychophysiological self-regulation, emotion evaluations, and resulting emotion dynamics. So far, these four domains have been looked at in relative isolation from each other, and their reciprocal influences and interactive effects have seldom been considered. This domain-specific focus constrains the progress the field is able to make. Here, we aim to pave the way towards more cross-domain, integrative research focused on understanding the raised reciprocal influences and interactive effects of strategy-based emotion-regulation, psychophysiological self-regulation, emotion evaluations, and emotion dynamics. To this aim, we first summarize for each of these domains the most influential theoretical models, the research questions they have stimulated, and their strengths and weaknesses for research and clinical practice. We then introduce the metaphor of a ball in a bowl that we use as a basis for outlining an integrative framework of dysregulated emotion. We illustrate how such a framework can inspire new research on the reciprocal influences and interactions between the different domains of dysregulated emotion and how it can help to theoretically explain a broader array of findings, such as the high levels of negative affect in clinical populations that have not been fully accounted for by deficits in strategy-based emotion regulation and the positive long-term consequences of accepting and tolerating emotions. Finally, we show how it can facilitate individualized emotion regulation interventions that are tailored to the specific regulatory impairments of the individual patient.

Keywords: affect regulation, emotion beliefs, psychophysiology, affective disturbances, affect dynamics

INTRODUCTION

Mental health problems are characterized by aberrant emotional experiences. These can take on many forms, such as low and flattened mood in the absence of context-sensitive emotional fluctuations in depression, chronically elevated levels and sudden peaks of anxiety in anxiety disorders, and emotional instability with sudden shifts between different emotional states in borderline personality disorder. These aberrant emotional experiences can be described best *via*

aberrancies in emotion dynamics, that is, in the patterns with which emotional experiences fluctuate over time (1). It is likely that these aberrancies in emotion dynamics result from dysregulation in the domains of strategy-based emotion regulation (2), psychophysiological self-regulation (3), and emotion evaluations (4). Within each of these domains, research has focused on elucidating the underlying mechanisms in order to better understand the precise difficulties that drive mental health problems.

In the first part of this article, we briefly summarize the most influential models for each of these domain-specific literatures. We begin with the domain of strategy-based emotion regulation, which has been central to most of the clinical research on emotion regulation so far. We continue with the domains of psychophysiological self-regulation and emotion evaluations and finally summarize the research on emotion dynamics, which result from the other domains and thereby represent the outcome of the processes involved in strategy-based emotion regulation, psychophysiological self-regulation, and emotion evaluations. For each of the domain-specific literatures, we identify difficulties that their models have in explaining some robust empirical findings and discuss their limited usefulness for clinical practice. We then argue that the field could make more progress by moving beyond these domain-specific research foci, because they have hindered the understanding of reciprocal influences between the different domains of dysregulated emotion. We demonstrate how first attempts to connect some of these domains have been fruitful and how this potential could be optimized by an overarching framework that integrates all of the domains.[1]

In the second part of this article, we introduce a metaphor of a ball in a bowl that inspired our way of thinking about the interplay between the domains of dysregulated emotion. We explain how we adapted the metaphor for our purposes and then map the different metaphor elements on the four domains of dysregulated emotion. Finally, we show how the resulting outline of an integrative framework of dysregulated emotion can be used to delineate new research questions, can provide more comprehensive explanations for available research findings, and can be used to derive multimodal individualized interventions.

DOMAINS OF DYSREGULATED EMOTION

Strategy-Based Emotion Regulation

Individuals can influence the intensity and duration of their emotional states *via* many different strategies. Although these processes are often simply referred to as emotion regulation (5), here we use the term "strategy-based emotion regulation" to differentiate these processes from other emotion regulatory mechanisms, such as psychophysiological self-regulation. The so far most influential account of strategy-based emotion regulation is the process model by Gross (6–8). In its earlier version, it introduced five categories of emotion regulation strategies. These

include situation selection, situation modification, attentional deployment, cognitive change, and response modulation, each of which is suggested to take effect at a different temporal stage of the emotion generation process (6). Together, these categories of emotion regulation strategies are thought to constitute a strategy repertoire comparable to a toolbox from which the right tool needs to be selected and successfully applied to fix the problem at hand [for an explicit use of the toolbox terminology, see (9)]. The subsequently developed extended process model maps out three stages of emotion regulation, namely, (I) identifying the need to regulate, (II) selecting an appropriate strategy from the repertoire of emotion regulation strategies, and (III) implementing the selected strategy to modify the emotional state (7, 8).[2] The extended process model postulates that emotion generation and the three emotion regulation stages can be broken down into a series of interlocking valuation cycles consisting of sequences of an aspect of the world, its perception, its valuation as positive or negative, and a resulting action. The extended process model postulates that deficits can arise at each subcomponent of each valuation cycle and that impairments in different components result in different symptoms of psychopathology (12, 13).

There have also been other extensions to the strategy-based model by Gross. One is the automatic emotion regulation account by Mauss et al. (14–16) that takes into account that emotion regulation strategies are not always consciously or willfully chosen but that their use can become automatic. Other emotion regulation theorists have pointed out that people regulate not only their own emotions but also those of other people [so-called social or interpersonal emotion regulation, see (17, 18)].

The strategy-based models of emotion regulation have stimulated an extensive research literature focusing on the frequency and success with which various strategies are employed. Specifically, researchers have looked at how the self-reported habitual use of different strategies is linked to emotional consequences and psychopathology cross-sectionally (2) and also prospectively (19). Experimental research has evaluated the effectiveness of different strategies to achieve short-term down-regulation of emotional states in experimental paradigms (20). Furthermore, experience-sampling studies have shed light on the frequency and short-term effectiveness of emotion regulation strategies in daily life [e.g., (21, 22)]. Researchers have also focused on flexibility and context sensitivity in strategy use (10, 23), automatic emotion regulation (15), and social emotion regulation (24). However, stages and components beyond the implementation stage have only recently started to attract some research attention [e.g., (9, 25)].

The strategy-based emotion regulation models have significantly advanced emotion regulation research. However, they also face explanatory difficulties. Their conceptual problems result in part from their grounding in the principles of cybernetic control theory (7, 26), an influential model of self-regulating systems applied in a broad range of contexts [e.g., (27–29)]. Key principles of control theory include comparisons of actual

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[1]Readers who are familiar with the research on the domains of strategy-based emotion regulation, psychophysiological self-regulation, emotion evaluations, and emotion dynamics are invited to skip our brief review of these literatures and to directly move to the second part of this article.

[2]For similar three-staged accounts of emotion regulation, see Bonanno and Burton (10) and Webb et al. (11).

against desired states and the stipulation that discrepancies entail the application of counter-regulatory mechanisms. Building on these principles, the strategy-based models of emotion regulation are based on the implicit assumption that to prevent unhealthy affect, undesirable emotional states need to be reduced *via* the selection and implementation of modificatory strategies (12).[3] Because of this assumption, the models are conceptually unable to account for robust evidence demonstrating that strategies such as awareness, acceptance, and tolerance, which do not involve reductions in the discrepancies between current and desired states (31, 32), nonetheless lead to positive mental health outcomes (22, 33, 34). Given this explanatory gap, it is not surprising that presentations of these models make no reference to such non-modificatory strategies as important components of the strategy repertoire (7, 13, 16, 17).

In contrast, the strategy-based emotion regulation account of Berking is not grounded in control theory principles and explicitly acknowledges the adaptive value of non-modificatory strategies [Adaptive Coping with Emotions (ACE) model; (31)]. The ACE model conceptualizes adaptive emotion regulation as a sequence of becoming aware of and labeling an emotion, analyzing its cause, providing self-support, and deciding to either modify or to accept and tolerate it. Contrary to the process model, the ACE model assumes both modificatory and non-modificatory strategies to be adaptive ways of dealing with emotional states. However, like the process model, it does not explain the mechanisms through which non-modificatory strategies confer their beneficial effects.

Second, strategy-based emotion regulation models have been criticized for their implicit assumption that emotional activation would perpetuate indefinitely unless emotion regulation strategies are applied: Kappas (35) points out that emotions are inherently self-regulating (I) because they motivate behaviors that tend to terminate the emotion-eliciting situation and (II) because they are governed by psychophysiological self-regulatory mechanisms that, following their activation, automatically activate processes to initiate their down-regulation [cf. (36, 37)]. The same point has also been highlighted by theorists who emphasize that experiencing emotions has beneficial effects that are facilitated by the self-regulatory characteristics of emotional experiences (38, 39). From this perspective, it is problematic that the process model attributes the aberrant levels of negative emotion that are reliably found in clinical populations [e.g., (40, 41)] solely to impairments in strategy-based emotion regulation (12, 13). Whereas questionnaire-based studies have reliably found deficits in strategy-based emotion regulation across mental disorders [for meta-analyses, see (42–45)], experimental studies have not consistently found the expected deficits in strategy use in clinical groups (46–49). Evidence from experience-sampling studies has also provided an inconclusive picture so far (50–52). This indicates that processes other than strategy-based emotion regulation need to be considered to account for the high levels of negative affect across clinical populations.

[3]For further control theory accounts of emotion regulation, see Larsen (30) and Webb et al. (11).

A third problem for the strategy-based emotion regulation models arises from evidence indicating that short- and long-term consequences of various emotion regulation strategies diverge. Specifically, maladaptive strategies such as suppression have been found to produce short-term reductions of undesired emotional states but negative longer-term emotional consequences (53). Conversely, adaptive non-modificatory strategies such as acceptance are less effective at achieving immediate emotional relief but show longer-term benefits for emotional states (54–57). As the strategy-based emotion regulation models define immediate reductions of the intensity of undesired emotions as regulation success (due to their being grounded in cybernetic control theory), they conceptually disregard the value of longer-term emotional consequences and imply that short-term beneficial effects also lead to longer-term emotional benefits. As a result, the strategy-based emotion regulation models do not specify which mechanisms account for discrepancies in short- and longer-term effects of different emotion regulation strategies.

Finally, Hofmann (58) noted that the direct contributions of strategy-based emotion regulation models to clinical practice have been limited. Some emotion regulation programs, such as emotion regulation therapy and the unified protocol, use the process model for psychoeducative purposes and encourage patients to enhance their repertoire of emotion regulation strategies (59–62). Also, Sheppes et al. (13) have argued that existing interventions, such as attentional bias modification (63), emotion regulation therapy (60, 61), dialectical behavioral therapy (64), and the affect regulation training (31), can be mapped onto different components of the extended process model. However, these programs were not directly derived from the process model and take a broader approach to emotion regulation including experiential, acceptance-based, and mindfulness-based techniques. Regarding the latter, the incompatibility of control-based models of emotion regulation with experience-based interventions has been highlighted (39), and Frederickson et al. (38) have argued that, in some situations, cognitive control strategies may even be detrimental as they can foster emotion avoidance.

In summary, strategy-based emotion regulation models offer a fine-grained account of subcomponents that are stipulated to constitute the emotion regulation process and have inspired a large research literature. However, because of their exclusive focus on strategy-based emotion regulation, they face explanatory difficulties to account for some of the findings in clinical emotion regulation research, and their usefulness for clinical practice is limited.

Psychophysiological Self-Regulation

Emotions are, by nature, self-regulatory because of their underlying psychophysiological mechanisms [cf. (35, 39)]. When external and internal challenges are encountered, physiological processes initiate regulation, with the goal to achieve adaptation and return to homeostasis when possible (36, 37). An influential theoretical account of psychophysiological self-regulation that underlies many of the more specific models in this field is the allostatic load model by McEwen (37). The term allostasis literally means "stability through change." It is

used to refer to psychophysiological adaptation and suggested to be subserved by so-called allostatic systems including neuroendocrine systems such as the hypothalamus–pituitary–adrenal axis, the autonomous nervous system, and the immune system. According to the allostatic load model, the short-term activation of these allostatic systems prepares individuals to deal with challenges. Chronic activation, by contrast, constitutes allostatic (over)load that in the long term leads to wear and tear of the body and brain (65, 66). The model postulates that to allow allostatic systems to recover and to maintain their functionality, they include negative feedback loops that automatically induce down-regulatory effects and keep their activity quantity- and time-limited (36). However, these self-regulatory mechanisms can become dysregulated and impaired because of genetic and environmental factors (67), which results in individual differences in how well psychophysiological activation can be adapted in accordance with environmental demands.

To better understand mental health problems, more specialized theories of psychophysiological self-regulation are useful, such as the model of neurovisceral integration by Thayer and Lane (68). This model suggests that a neural network (the central autonomic network) regulates the heart *via* sympathetic (stellate ganglia) and parasympathetic outputs (vagus nerve). The model postulates that impairments in the rapid parasympathetic regulation of cardiac activity (indexed by low heart rate variability) compromise the ability of the organism to flexibly adapt to changing external or internal demands. In other words, the impairments reduce the psychophysiological self-regulatory capacity, which has a negative impact on emotional experiences and mental health (3). Similarly, the polyvagal theory by Porges (69) proposes that aberrancies in the vagal structures that regulate the heart and the resulting lack of psychophysiological self-regulation play an important role in psychopathology.

The allostatic load model and the vagal theories that followed from it have motivated numerous empirical studies. For example, investigators have delineated how different allostatic systems respond to emotional states (36) and how these systems are interrelated (70, 71). Further questions have referred to how genetic and environmental factors influence the development of psychophysiological self-regulatory capacity (72–74) and how psychophysiological self-regulation may be impaired differently in different clinical populations (3, 75). Furthermore, research stimulated by the model of neurovisceral integration has sought to trace the relationship between parasympathetic cardiac control and cognitive performance (76–78).

The vagal theories by Thayer and Lane (68) and by Porges (69) can be used to theoretically integrate psychophysiological self-regulation with strategy-based emotion regulation, based on the suggestion that these two domains are subserved by shared neuronal networks. Disinhibition in these shared networks may therefore be responsible for impairments in both psychophysiological self-regulation and in strategy-based emotion regulation (79–81). In support of this claim, meta-analytic evidence points to positive but small associations between strategy-based emotion regulation on the one hand and heart rate variability as an autonomic nervous system marker of psychophysiological self-regulation on the other (82, 83). In a

different attempt to theoretically integrate psychophysiological self-regulation with strategy-based emotion regulation, Grecucci et al. (39) differentiated between top-down regulatory processes corresponding to strategy-based emotion regulation and automatic bottom-up processes corresponding to self-regulatory processes and further elaborated on how these routes are differentially addressed in psychological interventions.

The psychophysiological theories point towards mechanisms underlying psychophysiological self-regulation that can be addressed *via* a number of effective psychophysiological interventions when talking therapies are not sufficient [for a recent overview, see (84)]. For example, Mather and Thayer (80) reviewed how heart rate variability biofeedback stimulates vagal pathways and can positively influence functional connectivity in brain networks important for self-regulation. Recent empirical evidence corroborates this [e.g., (85, 86)]. Unlike the Gross model, the existing vagal theories made an effort to integrate strategy-based emotion regulation with psychophysiological self-regulation. However, although they are specific in the way they spell out the physiological underpinnings, they remain comparatively vague with regard to the specifications of strategy-based emotion regulation. For example, they do not elaborate on the different mechanisms *via* which modificatory and non-modificatory strategies are selected and how they affect emotional experiences. In addition, they do not integrate the domain of emotion evaluations, which plays a key role for dysregulated emotion.

Emotion Evaluations

Some authors have postulated that how emotional states are experienced depends on the individual's evaluations of these emotional states. This idea is reflected in models about emotional schemas (87), implicit theories of emotion (88), attitudes toward emotions (89), and beliefs about emotions (90), which share the assumption that emotions are evaluated based on certain beliefs about emotions. The same idea also features in a recent model of metaemotions, in which emotion evaluations are theorized to represent necessary prerequisites for the development of metaemotions (91). In all of these models, evaluations of emotions can refer to many different aspects or attributes of emotional states, but these can be grouped into two central types of emotion evaluations, namely, (I) whether the emotional state is evaluated as helpful vs. harmful (which influences how motivated the individual is to alter the emotional state) and (II) whether it is evaluated as controllable or uncontrollable [i.e., whether the individual feels capable of changing the emotional state; (90)].

This conception stands in the tradition of early theories on how individuals evaluate external environmental demands. In their transactional process model, Lazarus and Folkman (92) postulate that individuals evaluate (I) the motivational relevance of an environmental demand, that is, whether it is potentially harmful. Furthermore, Lazarus and Folkman postulate that individuals evaluate (II) their coping capacities to overcome the presenting environmental demand [cf. controllability; (90)]. Both types of evaluations are assumed to mutually influence each other so that following an evaluation as potentially harmful, individuals' evaluations of their coping capacities

further differentiate challenging from threatening perceptions of environmental demands (92, 93). In analogy to the Lazarus account, both an evaluation of an emotional state as potentially harmful and evaluations of personal capacities to deal with an emotional state can be assumed to crucially impact the further processing of this emotional state.

Although there has been relatively little research in this domain, empirical studies have started to test the assumptions stipulated in emotion evaluation theories. The focus of these studies has been on evaluations regarding the harmfulness and controllability of emotional states and how these are associated with emotional experiences, psychopathology, and well-being (88–90, 94–97). Furthermore, researchers have examined whether emotion evaluations can be changed and thus whether they are promising targets for psychological interventions (98).

Some progress has already been made in theoretically integrating emotion evaluations with strategy-based emotion regulation. Leahy (99) subsumed emotion evaluations and emotion regulation strategies under so-called emotional schemas, such as non-acceptance and rumination. Ford and Gross (90) added an evaluation component to the extended process model of emotion regulation (8). They suggest that beliefs regarding the harmfulness and controllability of emotional states motivate efforts to regulate these and influence the selection and implementation of regulatory strategies. In line with these considerations, several recent studies have focused on the idea that beliefs regarding the controllability of emotional states are associated with more active strategy-based emotion regulation efforts (4). In addition, associations between the evaluation of emotional states as unacceptable and the use of maladaptive regulatory strategies have been investigated (100).

A critique of the existing models of emotion evaluations is that most of them predominantly focus on evaluations concerning the controllability of emotional states (4), although the coping framework by Lazarus and Folkman (92) suggests a wider repertoire of evaluations to be relevant, including the capacity to accept. Also, despite having been inspired by Lazarus' original account, researchers have so far not investigated the interplay between evaluations of the harmfulness of emotional states and evaluations of personal capacities to deal with these emotional states (i.e., to change or accept them). This is a limitation because individuals' evaluations of an emotional state as potentially harmful and their evaluations regarding their ability to either modify or accept it can be expected to interact in influencing whether emotions are perceived as a manageable challenge or as an imminent threat and thereby influence which regulatory strategy will be used.

The failure to consider the interplay between harmfulness and capacity evaluations also limits the clinical utility of the existing evaluation models because it leaves limited potential for diagnosing the specific basis of individual problems in emotion processing (evaluations of the potential harmfulness of emotional states vs. evaluation of personal capacities to deal with emotional states vs. both). Consequently, there is also limited potential for designing and selecting specific interventions. Finally, the

existing evaluation theories have their main focus on beneficial effects of high controllability evaluations. In line with control theory, they implicate that discrepancies between experienced and desired emotional states can be volitionally reduced at any time. This strong emphasis on controllability implies that people can always be in control of their emotional states which seems to be a problematic message to communicate to patients. As emotions often cannot instantaneously be controlled, supporting patients to tolerate their emotions may be equally relevant to enhancing mental health and well-being.

Taken together, there is a growing body of research on emotion evaluations with a predominant focus on beliefs regarding the controllability of emotional states, whereas beliefs regarding one's resources to accept and tolerate emotional states have received little attention. A consistent application of Lazarus' model to the emotion evaluation literature would help to remedy this problem and to gain insight into the interactions between harmfulness evaluations and evaluations of personal capacities to deal with emotional states. Finally, a better understanding of how emotion evaluations are linked with strategy-based emotion regulation efforts, psychophysiological self-regulation, and resulting emotion dynamics is still lacking.

Emotion Dynamics

The term emotion dynamics refers to the patterns with which emotional experiences continuously fluctuate over time and thus reflects the outcome of the regulation effected by strategy-based emotion regulation, psychophysiological self-regulation, and emotion evaluations. Emotion dynamics have attracted the interest of many emotion theorists. To mention a few, Solomon and Corbit (101) described a normative sequence of how affect dynamically changes in response to environmental stimuli. In a first attempt to quantify affect dynamics, Richard Davidson (102) coined the term affective chronometry to describe the temporally dynamic features of emotional experiences and suggested defining features of emotion dynamics, such as rise time to peak and duration [for a more recent account, see (103)]. The seminal work of Frijda on the laws of emotion (104) distinguished different intensity profiles of emotion episodes. Most recently, Kuppens and Verduyn (105) put forward four principles that shape emotion dynamics, namely, the principles of contingency, inertia, regulation, and interaction.

Despite the extensive theorization on emotion dynamics, attempts to study them empirically have remained relatively scarce. The existing empirical studies have mostly focused on finding ways to capture individual differences in emotion dynamics. For this purpose, a number of arithmetically derived descriptors have been put forward. One is "emotional instability," which represents the amount of frequent and extreme moment-to-moment fluctuations in emotion intensity and which is usually calculated from squared differences between emotion intensities at successive measurement points (106). Others are "emotional inertia", which describes how strongly emotion intensities carry over from one moment to the next and is derived from autoregressive coefficients, and "emotional variability", which describes the amplitude or range of affective fluctuations and is captured *via* the standard deviation (107). Further

descriptors include "pulse", reflecting variability in intensity, and "spin", representing variability of qualitatively different emotional states in the two-dimensional core affect space of valence and arousal (108).[4]

These arithmetic descriptors have stimulated research that focuses on their associations with mental health outcomes. For instance, their application to experience-sampling data has been used to corroborate emotional instability in borderline personality disorder (113) and has also served as an inroad to delineating emotion dynamics in other mental disorders, including major depression, eating disorders, post-traumatic stress disorder, and psychosis (114–118). In a comprehensive meta-analysis, various forms of mental health problems were associated with more variable, unstable, but also more inert emotion dynamics (114). Aberrancies in emotion dynamics have also been analyzed as predictors of the transitions between episodes of psychopathology and mental health (1, 119, 120).

The literature of emotion dynamics still lacks a theoretical account that spells out the psychological or psychophysiological regulatory processes that influence emotional fluctuations over time. Nonetheless, there have been some empirical studies testing for associations between emotion dynamics and psychophysiological self-regulation as well as strategy-based emotion regulation. One found that emotional instability was linked with heart rate variability but not with strategy-based emotion regulation (121). Findings from others indicate that the use of reappraisal but not of suppression and rumination is associated with less inert emotional fluctuations over time (110, 112, 122, 123).

However, the lack of a theoretical model that specifies how emotion dynamics are shaped by different emotion regulatory processes renders empirical investigations in this field somewhat exploratory. The existing empirical findings cannot be interpreted in the context of an overarching framework, which prevents the generation of further-going research questions and theory-building. Also, the literature on emotion dynamics has not yet matured to a point where it directly benefits clinical practice. To reach this goal, disorder-specific aberrancies in emotion dynamics need to be reliably mapped and underlying mechanisms identified. Research activity could then be directed at developing interventions that ameliorate specific patterns of aberrant emotion dynamics.

Interim Conclusions

For each domain of dysregulated emotion, we have now provided a brief summary of the most influential theoretical models, the research questions they have stimulated, and their strengths and weaknesses for research and clinical practice. We conclude that strategy-based models would benefit from taking into account the self-regulatory functions of psychophysiological systems to be able to more explicitly incorporate experiential and acceptance-based approaches. In turn, psychophysiological accounts would benefit from being integrated with the specifications of how different emotion strategies are selected and how they affect

emotional experiences. Research on emotion evaluations would benefit from incorporating psychophysiological self-regulation, which would move — besides controllability evaluations — the benefits of evaluations of resources to accept and tolerate into focus. Finally, more research is needed to explore how emotion dynamics are shaped by strategy-based emotion regulation, psychophysiological self-regulation, and emotion evaluations. In summary, we conclude that a fully overarching framework that allows an integration of all four domains would advance the progress the field is able to make. Such an integrative framework would have to be able to explain how different aspects of dysregulated emotion act and interact leading to mental health problems, to account for findings that have so far remained conceptually unexplained, and would need to facilitate the tailoring of intervention approaches to individual patients' needs. In the following, we will describe how we outlined such an integrative framework inspired by the metaphor of a ball in a bowl, which we used as a crutch to help us to integrate the different domains of dysregulated emotion.

THE BALL-IN-BOWL METAPHOR

The Original Ball-In-Bowl Metaphor by Boker

Boker uses the metaphor of a ball placed in a bowl to develop a framework for psychological systems that include multiple regulatory forces (124). His recourse to a metaphor stands in the tradition of many influential scientific models that have benefited from metaphorical thinking, such as the tree of life in Darwinian conceptualizations of evolution (125), references to waves and particles in physics (126, 127), and metaphorical conceptualizations of attention as a moving spotlight or a limited resource in cognitive psychology and neuroscience (128). Psychological interventions also employ metaphors to facilitate understanding, such as when mindfulness is compared to watching clouds moving across the sky (129). The use of metaphors has thus proven helpful for conceptualizing complex processes in theory and clinical practice.

The concept of emotion regulation itself has also already been approached *via* analogies. In the context of the Gross model, the repertoire of emotion regulation strategies has been compared to a toolbox from which the right tool has to be selected and successfully applied (9). Furthermore, and with some resemblance to the metaphor we will be presenting here, Grecucci et al. (130) illustrated how emotion regulatory processes are initiated in the brain by using an analogy from statistical mechanics, a branch of physics that applies probability theory to thermodynamic systems. They propose that, similar to the thermodynamic regulatory processes captured by the Boltzmann distribution, the brain initiates regulatory mechanisms — which in this model take on the form of psychodynamic defenses — when the tolerability threshold to bear the respective emotion is exceeded.

In Boker's ball-in-bowl metaphor, the bottom of the bowl represents the preferred equilibrium point of the ball. When an external force operates on the ball, the ball is set in motion

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[4]For mathematically more advanced methods of capturing emotion dynamics, see Chow et al. (109); Kuppens et al. (110); Montpetit et al. (111); Oravecz et al. (112).

and moves up the bowl walls. At some point, the imposed external force and the force of gravity are in balance, and the ball maintains a stable position. When the external force terminates, the ball finds its way back to its preferred equilibrium at the bottom of the bowl, due to the force of gravity and the curvature of the bowl. Boker considers this to be a fast regulation process resulting from an automatic balancing of forces. He also assumes that if the external force continues to apply over an extended period of time, the ball remains at its new, non-preferred equilibrium point up the wall of the bowl. However, in such situations, the bowl can be tilted (i.e., leaned sideways) in such a way that the ball is again situated at the bottom of the bowl. Importantly, the bowl is now no longer in a level position but tilted to the side. Boker calls this process adaptation and conceptualizes it at a slower timescale than the fast regulation process resulting from the curvature of the bowl.

From the metaphor of a ball in a bowl, Boker derives his Adaptive Equilibrium Framework (124). This framework offers a multiprocess regulation account that is meant to inform models of various self-regulating human systems. In the application of his framework to emotion regulation, Boker takes the ball to represent either positive or negative emotion. However, he does not specify the psychological processes corresponding to the stipulated fast regulation process (=bowl curvature) and the slower adaptation process (=tilting the bowl). Therefore, Boker does not connect his framework to the domains of strategy-based emotion regulation, psychophysiological self-regulation, and emotion evaluations.

Adapting the Ball-In-Bowl Metaphor

We started with the simple ball-in-bowl metaphor by Boker and then adapted and extended it in a way that would make it possible to map the specific metaphor elements onto the domains of strategy-based emotion regulation, psychophysiological self-regulation, emotion evaluations, and emotion dynamics. We remained with Boker's image of a ball in a bowl to represent how emotions (=the ball) are constrained by two distinct regulatory forces (=bowl curvature and bowl-tilting). However, we amended Boker's account in how the effects of bowl-tilting are specified. We also added varying degrees of bowl curvature and colored zones in the bowl walls. In this section, we will present the individual elements of our adapted ball-in-bowl metaphor, staying within the language of the metaphor. In the following section, we will map each metaphor element onto one of our psychological concepts of interest, namely, strategy-based emotion regulation, psychophysiological self-regulation, emotion evaluations, and emotion dynamics.

Dynamic Ball Movements
Like Boker's metaphor, the adapted metaphor posits a ball in a bowl with its equilibrium point at the bottom of the bowl (**Figure 1a**, Panel A). When an external force is applied, it drives the ball up the bowl walls (**Figure 1a**, Panel B). When the external force is terminated or reduced, the trajectory of the ball eventually levels off at the bottom of the bowl (**Figure 1a**, Panel C).

Bowl Curvature
Both Boker's account and the adapted metaphor explain the leveling-off of ball movements *via* bowl curvature, which draws the ball back toward the bottom of the bowl. However, the adapted ball-in-bowl metaphor introduces the additional feature that bowl curvature can differ on a continuum from very shallow to very steep. In shallow bowls, the effect of bowl curvature is relatively weak. As a result, when an external force is applied in shallow bowls (**Figure 1b**, Panel A), the ball easily moves up the walls and subsequently also takes longer until its movements level off. By contrast, in very steep, vase-like bowls, external forces will rarely be strong enough to effect ball movements (**Figure 1b**, Panel B). Finally, in bowls with a moderate degree of curvature (**Figure 1b**, Panel C), external forces are assumed to lead to some dynamic ball movements but these subside in a timely manner.

Bowl-Tilting Strategies
Alongside the effect of bowl curvature, both Boker and the adapted ball-in-bowl metaphor stipulate that the bowl can be tilted (i.e., leaned sideways) to influence the trajectory of the ball. Unlike Boker's account, however, the adapted metaphor specifies that this tilting can either be hasty and ineffective (**Figure 1c**, Panel A), which prevents ball movements from leveling off, or skillful and effective (**Figure 1c**, Panel B), which facilitates the settling down of ball movements. Finally, the adapted metaphor explicitly includes the possibility of keeping the bowl stable to leave it to bowl curvature to bring the ball back to its equilibrium point (**Figure 1c**, Panel C).

Colored Zones
In the adapted ball-in-bowl metaphor, the bowl walls are divided into three zones colored green, yellow, and red. These signal the extent to which ball movement amplitudes peaking in these zones bear the risk of overshooting the edge of the bowl. Green-zone signals communicate that ball movement amplitudes are safe (**Figure 1d**, Panel A), yellow-zone signals give an indication of moderate risk (**Figure 1d**, Panel B), and red-zone signals communicate high risk (**Figure 1d**, Panel C). The width of these zones can vary, and this determines the specific thresholds of ball movement amplitudes at which green-, yellow-, and red-zone signals are elicited (**Figure 1d**, Panels A,B).

In summary, the adapted ball-in-bowl metaphor includes three regulatory processes that influence how the ball dynamically moves within the bowl. These are (I) bowl curvature (**Figure 1b**), (II) bowl-tilting skills (**Figure 1c**), and (III) the colored zones that signal risk of ball movement amplitudes overshooting the edge of the bowl (**Figure 1d**). Furthermore, the adapted metaphor specifies that variation is possible for each of these regulatory processes so that bowl curvature can differ in steepness, tilting capacity in aptness, and colored zones in their widths.

Mapping the Metaphor Elements Onto the Domains of Dysregulated Emotion

Contrary to Boker, who did not specify the psychological analogs of his metaphor elements, we then mapped all components of the

a. Fundamental Features of Ball-in-Bowl Metaphor

A.   B.   C.

Graphical depiction of the fundamental features of the ball-in-bowl metaphor. The default position of the ball is at the bottom of the bowl at its equilibrium point (*Panel A*). The application of an external force displaces the ball up the bowl walls (*Panel B*). When the external force subsides, ball movements level off (*Panel C*).

b. Variability in Bowl Curvature

A.   B.   C.

Graphical depiction of variability in bowl curvature from very shallow (*Panel A*) to very steep (*Panel B*). In very shallow bowls, external forces easily move the ball up the bowl walls and the down-regulatory effect of bowl curvature is relatively weak. In very steep bowls, by contrast, only very strong external forces will displace the ball from its equilibrium point. Curvature of a moderate degree (*Panel C*) allows for external forces to displace the ball from its equilibrium point but bowl curvature subsequently effects timely levelling-off of ball movements.

c. Bowl-Tilting Strategies

A.   B.   C.

Graphical depiction of different bowl-tilting strategies and their effects on resulting ball movements. Hasty and ineffective tilting prevents the ball from settling back at its equilibrium point (*Panel A*), whereas skilful and effective tilting effects quick declines of ball movements amplitudes (*Panel B*). Keeping the bowl still allows the effect of bowl curvature to eventually level off (*Panel C*).

d. Coloured Zones within Bowl

A.   B.   C.

Graphical depiction of coloured zones within the bowl. The width of these zones can vary (*Panel A vs. Panel B*) and zone signals become activated as ball amplitudes peak in the respective zones. Specifically, red-zone signals communicate high risk of the ball overshooting the edge of the bowl (*Panel C*), yellow-zone signals indicate moderate risk (*Panel B*) and green-zone signals communicate that ball movements are safe (*Panel A*).

FIGURE 1 | Graphical depictions of the different elements of the bowl-in-bowl metaphor. **(a)** Fundamental Features of Ball-in-Bowl Metaphor. **(b)** Variability in Bowl Curvature. **(c)** Bowl-Tilting Strategies. **(d)** Colored Zones Within Bowl.

adapted ball-in-bowl metaphor onto the corresponding domains of dysregulated emotion (for an overview, see **Table 1**).

Ball Movements as Emotion Dynamics

In the adapted ball-in-bowl metaphor, the ball represents discrete emotions such as anxiety or anger. External forces that set the ball in motion stand for internal or external events through which the emotion becomes activated. When the ball lies at its equilibrium point at the bottom of the bowl, this corresponds to a state in which the emotion is at its zero point. The adapted metaphor also specifies that the amplitude of the ball movements corresponds to emotion intensity, and alterations of ball amplitudes over time represent temporal emotion dynamics.

Bowl Curvature as Psychophysiological Self-Regulatory Capacity

Different degrees of bowl curvature (shallow–steep) represent individual differences in psychophysiological self-regulation capacity. More shallow bowls correspond to reduced capacity for psychophysiological down-regulation, which is associated with faster and higher increases in emotion intensity and longer recovery times. By contrast, very steep, vase-like bowls that allow for no ball movement represent high rigidity. Like low psychophysiological self-regulation capacity, this can be assumed to be maladaptive because emotions convey important

TABLE 1 | Elements of the ball-in-bowl metaphor and their psychological analogs.

Elements of the ball-in-bowl metaphor	Psychological analogs
Ball	Emotion
Amplitudes of ball movements	Emotion intensities
Fluctuations in ball movement amplitudes	Emotion dynamics
Bowl curvature	Psychophysiological self-regulatory capacity
Bowl-tilting	Strategy-based emotion regulation
Colored zones	Emotion evaluations

information, and some emotional responsiveness is needed to engage with environmental challenges.

Bowl-Tilting as Strategy-Based Emotion Regulation

Within the adapted metaphor, bowl-tilting represents the application of emotion regulation strategies. Targeted and skilful tilting corresponds to adaptive modificatory emotion regulation strategies, such as reappraisal. These strategies are considered adaptive because when properly applied they successfully remove

momentum from emotion dynamics.[5] In addition, keeping the bowl still until ball movements have leveled off corresponds to non-modificatory strategies, such as awareness, acceptance, and tolerance. These constitute a second type of adaptive strategies as over time they also effect reductions in emotional momentum. By contrast, hasty and ineffective tilting that keeps the ball in motion corresponds to maladaptive emotion regulation strategies, such as rumination and suppression. These are referred to as maladaptive strategies because either they do not reduce emotional intensity at all, or they hastily achieve emotional down-regulation, but without actually reducing the emotional momentum. This results in renewed emotion peaks and long-term emotional instability, which in turn initiates continuous regulatory efforts.

Colored Zones as Emotion Evaluations

The colored zones on the bowl walls represent evaluations of whether the intensity of emotional states bears the potential for harm. Specifically, ball movement amplitudes in the red zone, which signal high risk for the ball to overshoot the edge of the bowl, correspond to evaluations of emotion intensities as threatening. Ball movement amplitudes in the yellow zone, which signal moderate risk of ball movement amplitudes, correspond to evaluating emotion intensity as challenging but manageable. Finally, ball movement amplitudes in the green zone, communicating that ball movements are safe, correspond to emotion intensities evaluated as helpful.

These colored zones and the corresponding signals of threat (red zone), challenge (yellow zone), and helpfulness (green zone) result from the combination of harmfulness evaluations and evaluations of personal capacities to modify or accept emotional states. Harmfulness evaluations refer to the motivational relevance, that is, whether they are helpful or bear the potential for harm. Evaluations of personal capacities to deal with the emotional state include modificatory strategies such as cognitive reappraisal and/or non-modificatory strategies such as awareness, acceptance, and tolerance. Hence, when an emotional state is evaluated as potentially becoming harmful, an evaluation of individual abilities to deal with the emotional state determines whether it is evaluated as a manageable challenge (yellow zone) or as a threat (red zone). Only when resources to either modify or to accept and tolerate the potentially harmful emotional state are evaluated as insufficient, it will be evaluated as threatening.

Using the Adapted Metaphor to Outline an Integrative Framework of Dysregulated Emotion

The idea at the heart of this article is that dysregulated emotion plays an important role for mental health problems and can be described best *via* aberrancies in emotion dynamics that arise

due to dysregulation in one or more of the domains of strategy-based emotion regulation, psychophysiological self-regulation, and emotion evaluations. In clinical research, empirical studies on the interactive effects between these domains have been relatively scarce, at least in part because an integrative framework that can guide such cross-domain investigations has been lacking. We found that the adapted ball-in-bowl metaphor can be a helpful crutch to outline such an integrative framework, firstly because it facilitates an intuitive understanding of the complex cross-domain interactions and secondly because it prepares the ground for theory-guided research based on clear and directed hypotheses and thereby prevents haphazard correlational studies that lack sufficient theoretical underpinning.

In a nutshell, the adapted ball-in-bowl metaphor suggests that aberrant ball movements (i.e., dysregulated emotion) can arise because of (I) deficient bowl-tilting skills (i.e., maladaptive strategy-based emotion regulation), (II) shallow or overly steep bowl curvature (i.e., maladaptive psychophysiological self-regulation), and (III) overly prominent red zones (i.e., dysfunctional evaluations of emotional states). These three domains are assumed to influence each other in their impact on the resulting ball movements (i.e., emotion dynamics). Multiple interactive effects can be derived from the adapted ball-in-bowl metaphor. For example, shallow bowls come with less down-regulation of ball movements, but good tilting skills can compensate for this and can help to achieve reductions in ball movement amplitudes. Furthermore, red-zone signals motivate hasty tilting attempts to prevent the ball from overshooting the edge of the bowl.

These metaphor-based specifications can thus be used to outline a framework for understanding dysregulated emotion (**Figure 2**) and, more importantly, can be translated into a series of testable hypotheses on how the interplay of aberrancies in the four domains of strategy-based emotion regulation, psychophysiological self-regulation, emotion evaluations, and resulting emotion dynamics may result in mental health problems. Specifically, the assumptions outlined in the previous paragraph, formulated within the language of the metaphor, can be translated into the corresponding psychological terms, which provides the outline of a new dysregulated emotion framework. Strategy-based emotion regulation and psychophysiological self-regulation moderate their respective effects on emotion dynamics. Specifically, low psychophysiological self-regulatory capacity is likely to make strategy-based emotion regulation more challenging. In reverse, adaptive strategy-based emotion regulation could compensate for low psychophysiological self-regulatory capacity or a rigid psychophysiological response to the environment. Furthermore, deficits in one domain can be assumed to produce cascading effects in the other domains, thereby potentiating the effects on resulting emotion dynamics. Specifically, threatening evaluations of emotional states could be associated with frequent use of maladaptive emotion regulation strategies such as rumination or suppression. This is then likely to be linked with aberrant emotion dynamics and with continuous regulatory efforts. By contrast, evaluations of emotional states as challenging but manageable can be hypothesized to be associated with adaptive strategies, such as reappraisal and

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[5]Here, the adaptiveness of emotion regulation strategies refers to their effectiveness to down-regulate emotional states, under the assumption that the present emotional state is appraised as challenging or threatening. However, when an emotional state is appraised as helpful, up-regulation of emotion intensity can also be adaptive. The reader is referred to the subsequent paragraph in which we discuss how emotion evaluations are represented in the adapted ball-in-bowl metaphor.
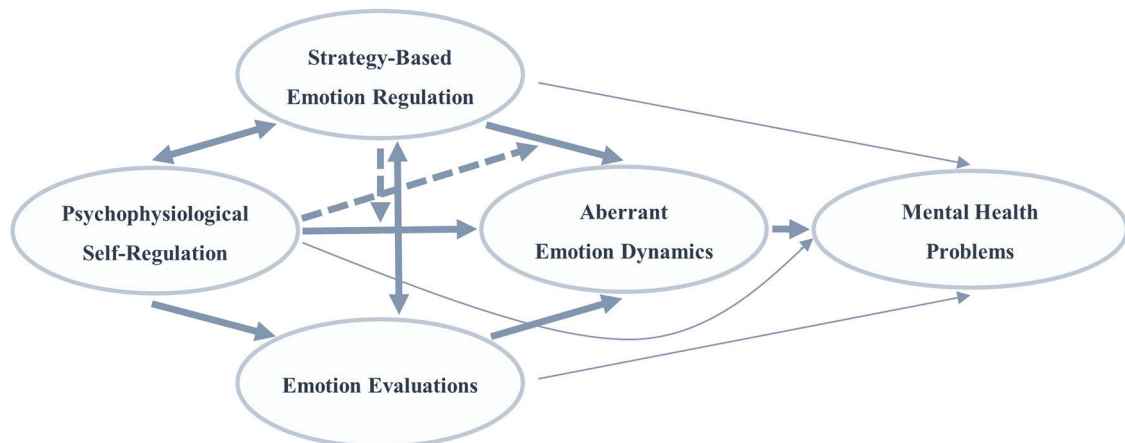
FIGURE 2 | Graphical illustration of the integrative framework of dysregulated emotion. Emotional dysregulation is assumed to occur as a result of the interplay between strategy-based emotion regulation, psychophysiological self-regulation, and emotion evaluations and to be reflected in aberrant emotion dynamics. Mental health problems are expected to result from dysregulated emotion. Hypothesized paths are indicated by arrows. Solid bold arrows depict direct associations or mediations *via* another domain. Dotted arrows illustrate moderation effects. Besides their main path *via* aberrant emotion dynamics, all domains are also assumed to be directly associated with mental health problems, represented here *via* thin arrows.

acceptance. These are assumed to effectively reduce emotion intensities, thereby preventing renewed emotional peaks and aberrant emotion dynamics. Finally, low psychophysiological self-regulation and poor strategy-based emotion regulation can be assumed to give rise to repeated experiences of sustained emotional activation in the absence of adequate resources to deal with these emotional states. This is likely to foster evaluations of emotional states as threatening.

Furthermore, the integrative framework of dysregulated emotion suggests that emotion dynamics represent the central pathway from dysregulation in strategy-based emotion regulation, psychophysiological self-regulation, or emotion evaluations to mental health problems. Thus, we expect that in most situations, dysregulation in strategy-based emotion regulation, psychophysiological self-regulation, or emotion evaluations will distort emotion dynamics and that mental health problems then follow from these distortions. Nonetheless, the framework also allows for direct and isolated influences from strategy-based emotion regulation, psychophysiological self-regulation, and emotion evaluations to mental health problems (thin arrows in **Figure 2**). Hence, the framework does not preclude the possibility that dysregulation in a single domain has a direct influence on mental health problems regardless of the emotion dynamics.

Integrating Existing Findings

The proposed links of the integrative framework of dysregulated emotion are backed up by a range of existing findings, such as the well-replicated observation that heart rate variability and other indicators of psychophysiological self-regulation are associated with strategy-based emotion regulation (82, 83) and with aberrant emotion dynamics (121), by the links between strategy-based emotion regulation and aberrant emotion dynamics [e.g., (110, 123)], and by the associations between

evaluations of emotions and the use of different types of emotion regulation strategies (4, 96). Furthermore, the framework is in line with research indicating robust associations between aberrant emotion dynamics and mental health problems (114). In addition, it can explain some robust findings that the existing models summarized in the first part of this article have struggled to make sense of. One is that non-modificatory strategies, such as awareness, acceptance, and tolerance, which do not in and of themselves achieve reductions in emotion intensities, have nonetheless repeatedly been shown to predict positive mental health outcomes (22, 34). The integrative framework suggests that non-modificatory strategies do not directly modify emotional states but that they enable the psychophysiological self-regulatory processes to do so. Finally, by focusing only on one or two aspects of emotion regulation at a time, the existing models of emotion regulation have struggled to fully account for the high levels of negative affect in clinical populations. In contrast, the integrative framework suggests that high levels of negative affect can occur due to dysregulation located either in strategy-based emotion regulation, or in psychophysiological self-regulation, or in emotion evaluations. Thus, while one domain, such as strategy-based emotion regulation, may be intact, high levels of negative affect may result from problems in other domains.

Clinical Usefulness

A major advantage of the adapted ball-in-bowl metaphor is that it can be used in clinical interventions as a simple and intuitive, transdiagnostic explanatory model that stimulates individualized approaches to emotion dysregulation. The metaphor encourages practitioners to not prematurely assume that regulation difficulties must be strategy-based in nature, but to also consider psychophysiological self-regulation, emotion evaluations, and their joint effects on resulting

emotion dynamics. In the mindset of the integrative framework of dysregulated emotion, emotion regulation interventions would start with individualized case formulations that profile each patient's impairments and resources in the framework domains. From this analysis, patient-specific intervention plans can be derived. Depending on patients' profiles, these plans may or may not include work on strategy-based emotion regulation (31, 131–133), psychophysiological self-regulation [e.g., *via* relaxation techniques, physical exercise, or heart rate variability biofeedback training; see (134–136)], and emotion evaluations [e.g., *via* techniques from cognitive therapy; see (137)]. Such individualized interventions are likely to be more effective than the one-size-fits-all approach of currently available emotion regulation trainings.[6] Furthermore, ecological momentary interventions (139) may be promising to further advance individualized interventions as they could be programmed to detect dysregulated emotion and to prompt personalized supportive input.

Second, the adapted ball-in-bowl metaphor can serve as an easily accessible visualization tool for the direct work with patients because it can illustrate specific emotion regulation problems and their consequences. For example, the metaphor can be used to explain why maladaptive strategies such as rumination and suppression keep emotional activation going, why emotional states do not necessarily require modificatory regulation to decline, and how evaluations of emotions as threatening lead to hasty and ineffective strategy-based regulation attempts that aggravate rather than resolve the emotional difficulties at hand. Furthermore, the flexibility of the metaphor with regard to which specific emotion is represented by the ball makes it a versatile tool that can be applied to the specific emotion regulation problems of individual patients.

Limitations and Future Directions

The adapted ball-in-bowl metaphor and the integrative framework of dysregulated emotion are not without constraints. First, they build on the distinction between adaptive and maladaptive strategies. This categorization has been criticized and adaptive emotion regulation has been said to involve the flexible selection of strategies in accordance with situational demands (10, 23). Although we agree that rigid classifications of individual strategies are problematic, we nonetheless justify this distinction with the robust research evidence showing that the habitual use of certain strategies is associated with psychopathology (2). Another potentially problematic aspect is that we conceptualized maladaptive strategies as capable of achieving short-term reductions of emotion intensity. Alternatively, it may be the case that the short-term benefit of maladaptive strategies lies not primarily in emotion intensity reductions but more in the subjectively experienced sense of control that accompanies using these strategies [for a similar line of argument, see (140)]. Furthermore, it is also conceivable that the different domains could have been mapped onto other than the allocated elements of the metaphor. However, the

chosen pairings seemed the most intuitive ones and have proven advantageous for deriving compelling hypotheses. In addition, it must be noted that the metaphor of a ball in a bowl is just one of many conceivable metaphors to aid the integration of the domains of dysregulated emotion. Other metaphors might emphasize different interrelations between the network domains, which would result in different model formulations.

Looking ahead, the integrative framework of dysregulated emotion awaits empirical testing and the clinical utility of the metaphor needs to be evaluated in direct work with patients. Future work could also focus on extending the framework to include additional domains. For instance, it may be helpful to add emotional awareness as a separate domain, represented in the metaphor as the detection, identification, and non-judgmental monitoring of a specific kind of ball and the amplitude of its movements. Similarly, compassionate self-support could be included as an additional domain that could be represented by a confident attitude regarding bowl-tilting [(141); also cf. compassion-focused therapy, (142)]. Another metaphor extension could introduce the possibility that more than one ball can simultaneously be in the bowl. This would represent multiple concurrently activated emotions that may also interact with each other. Moreover, it is conceivable that more than one strategy is applied to deal with an emotion [cf. (143)] and that multiple maladaptive strategies could be used in a hasty attempt to reduce emotion intensity.

In addition, research should focus on the genetic and environmental factors that influence the developmental pathways of the framework domains, especially during sensitive developmental periods. For instance, observational learning in childhood can be assumed to influence the development of strategy-based regulation (144); childhood adversities, and inflammations of the immune system are likely to constitute risk factors for decreased psychophysiological self-regulation capacity (67, 145), and caregivers' beliefs about emotions and their reactions to emotion displays may shape individuals' emotion evaluations.

In summary, the integrative framework of dysregulated emotion derived from the adapted ball-in-bowl metaphor can inspire a new generation of theory-driven research activity with the potential to explain a broader array of research findings and to increase the usefulness of the field for clinical practice.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

UN, MW, and TL developed the idea. UN and MW wrote the first draft of the manuscript. TL provided extensive feedback and made amendments. AC provided advice on specific sections and feedback on the final version of the manuscript. All authors have approved the final manuscript.

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[6]For a similar argument regarding interventions for negative symptoms in schizophrenia, see Lincoln et al. (138).

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BRIEF ARTICLE

How you think about an emotion predicts how you regulate: an experience-sampling study

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ABSTRACT

Emotion evaluations are assumed to play a crucial role in the emotion regulation process. We tested a postulate from our framework of emotion dysregulation (Nowak, U., Wittkamp, M. F., Clamor, A., & Lincoln, T. M. [2021]. Using the Ball-in-Bowl metaphor to outline an integrative framework for understanding dysregulated emotion. *Frontiers in Psychiatry*, *12*, 118), namely that the extent to which individuals evaluate an emotion as harmful and their personal resources to modify and accept/tolerate the emotion as sufficient predict the subsequent use of regulation strategies. Participants ($n = 118$) from a community sample took part in an experience-sampling assessment over 7 days including 10 daily paired measurements. The first measured momentary affective valence and arousal along with harmfulness evaluations and evaluations of personal resources to modify and accept/tolerate an emotion. The second followed three minutes later and measured emotion regulation strategies. The more harmful individuals evaluated an emotion, the more likely they were to use an emotion regulation strategy. The more harmful individuals evaluated an emotion, and the less sufficient they evaluated their personal resources to accept/tolerate an emotion, the more likely they were to use a maladaptive emotion regulation strategy. We conclude that emotions that people evaluate as harmful or difficult to accept are most likely to be regulated in a maladaptive manner. This implies that modifying beliefs about emotions could represent a promising treatment approach.

How individuals perceive, evaluate and modify the quality, duration, and intensity of their emotions has been referred to as emotion regulation (Thompson, 1994) and is essential for mental health and well-being (Sheppes et al., 2015). When an emotion is present, individuals can leave its trajectory to self-regulating processes (Kappas, 2011) or they can choose to actively regulate the emotion. In their adaptive coping with emotions model, Berking and Whitley (2014) theorised that this can occur using modificatory strategies with the aim to change the emotion, such as cognitive reappraisal and problem-solving, or non-modificatory strategies with the aim to stay in contact with the emotion, such as acceptance and tolerance. Naragon-Gainey et al. (2017) found

that some strategies, such as cognitive reappraisal and acceptance, loaded on a common factor (cf. Sheppes et al., 2014). Overall, these strategies have also been associated with better health and well-being and therefore have been referred to as adaptive (Aldao et al., 2010; Ford et al., 2018). Other strategies, such as avoidance and rumination, have been found to load on highly correlated factors named disengagement and aversive cognitive perseveration (Naragon-Gainey et al., 2017). Although they can be successful in down-regulating emotions in certain contexts (e.g. Bonanno & Burton, 2013), these strategies have been found to be overall positively related to psychopathology and therefore have been referred to as maladaptive (Aldao et al., 2010; Campbell-Sills et al.,

2006). The variety of possibilities to respond to emotions raises the question what motivates individuals to regulate their emotions in a certain way.

One aspect that is increasingly being recognised as relevant for how emotions are regulated are individuals' beliefs about the harmfulness and controllability of emotions (Ford & Gross, 2018). For example, a cross-sectional questionnaire study by Karnaze and Levine (2018) found that people who believed emotions to be generally harmful used more suppression of the emotional experience whereas people who believed emotions to be helpful used more cognitive reappraisal. Similarly, a review demonstrated an association between beliefs about the general controllability of emotions and an elevated use of adaptive strategies, such as cognitive reappraisal (Kneeland et al., 2016). This association was further corroborated by recent studies using the experience-sampling method (ESM) that found general controllability beliefs about emotions at baseline to be associated with the use of cognitive reappraisal in daily life (Kneeland et al., 2020; Ortner & Pennekamp, 2020). Research on emotion beliefs has so far relied on trait measures of general beliefs about emotions. However, Ford and Gross (2018) have postulated emotion beliefs to vary with regard to specific emotions and contexts. Therefore, it is more informative to investigate beliefs about specific emotions as they occur in daily life. This would also allow us to look at the moment-to-moment associations with emotion regulation. Moreover, research so far has mainly focused on understanding which beliefs motivate the use of cognitive reappraisal and suppression. Less well understood is why individuals decide to accept their emotions. This is particularly relevant because acceptance is not only theorised to represent an alternative strategy to respond to emotions (Berking & Whitley, 2014) but has also been shown to be frequently used (Heiy & Cheavens, 2014; Lennarz et al., 2019), and to promote mental health (Ford et al., 2018).

So far, beliefs about the harmfulness and controllability of emotions have been looked at separately. This leaves open whether these beliefs exert an independent influence on emotion regulation or interact. Recently, we developed a framework that may be useful to understand their interaction. It builds on Lazarus and Folkman's (1987) attempt to describe coping, a process similar to emotion regulation. They argued that reactions towards an environmental demand could be best understood by considering the interplay between the environment and the individual. Specifically, they theorised that how individuals cope with an environmental demand depends on whether they evaluate (1) the demand as potentially harmful and (2) their resources to cope with it as sufficient. Thus, individuals' perceived resources to respond to a demand can potentially enhance or mitigate the threat allegedly posed by it. In our adaptation of this framework (Nowak et al., 2021) we postulated that individuals evaluate (1) whether an emotion is harmful or helpful, and (2) whether they have sufficient resources to either modify or accept/tolerate it. When they evaluate an emotion as potentially harmful, this is assumed to motivate regulatory efforts. Evaluations of having greater personal resources to either modify or accept/tolerate an emotion are postulated to determine whether individuals apply modificatory strategies or non-modificatory strategies. Thus, if individuals evaluate an emotion as harmful but their personal resources to regulate it as sufficient, this would cause the emotion to be perceived as a manageable challenge and motivate a modificatory or non-modificatory adaptive strategy.[1] For example, when individuals evaluate their resources to accept/tolerate as sufficient, this would buffer the threat perceived by a harmful emotion and encourage them to use acceptance. In contrast, when individuals evaluate an emotion as harmful and their personal resources to modify and accept/tolerate it as insufficient, they would be more likely to perceive this emotion as an unmanageable threat, which would strengthen their motivation to avoid the emotion by using a maladaptive strategy. Hence, this framework allows to predict which types of emotion evaluations precede certain ways of regulating an emotion in daily life. To test these theoretical predictions, we used an ESM design that makes it possible to capture the moment-to-moment associations between emotion evaluations (i.e. harmfulness, personal resources to modify and accept/tolerate) and subsequent emotion regulation strategy use. We hypothesised that:

(1) When individuals evaluate a given emotion as more harmful they are more likely to employ any type of regulation strategy.
(2) When individuals evaluate their personal resources to modify a given emotion as sufficient they are more likely to use a modificatory strategy than a non-modificatory strategy to regulate that emotion. When they evaluate

their resources to accept/tolerate a given emotion as sufficient they are more likely to use a non-modificatory than a modificatory strategy.

(3) When individuals evaluate a given emotion as more harmful and their resources to modify and accept/tolerate as insufficient they will more likely use a maladaptive than an adaptive strategy to regulate that emotion.

Method

Procedure

We recruited a community sample via online platforms, newsletters, and leaflets in public spaces in Hamburg, Germany. Inclusion criteria were an age between 18 and 65 and sufficient German language skills. Participants were screened for eligibility via telephone and invited for an assessment at Universität Hamburg where they underwent an electrocardiogram (ECG) measurement and completed baseline questionnaires on psychopathology and emotion regulation, which are not part of the present analyses. Furthermore, they were assessed for lifetime mental disorders. Then, a study instructor provided and explained an instruction sheet on all items that were assessed during the subsequent seven-day ESM phase and prepared the participant's private smartphone, or a smartphone provided by the university, for the application movisensXS, Version 1.4.8 (movisens GmbH). After the ESM phase, participants received a graduated monetary compensation of maximum 40 Euros oriented at common compensations in ESM studies and were debriefed. The study was approved by the local ethics committee.

ESM design

For seven consecutive days, between 9 am and 10 pm, participants received 10 pairs of signal-contingent, semi-random (cf. Wheeler & Reis, 1991) alarms per day with minimum gaps of one hour between measurements. Each pair consisted of a first measurement point (t), in which affective valence and arousal, evaluations of the harmfulness of an emotion and evaluations of personal resources to modify, accept, and tolerate were assessed. A second measurement point followed three minutes later ($t+3$ min) and included a single-choice list of emotion regulation strategies (see Figure 1).

ESM measures

Affective valence and arousal were assessed via visual analogue scales with anchors (valence: 0 = extremely unwell/discontented–100 = extremely well/contented, arousal: 0 = extremely calm /relaxed–100 = extremely unsettled/tense). Anchor terms were taken from the valence and arousal items of the Mood Scale for ESM studies (Wilhelm & Schoebi, 2007) and complemented by the adjunct "extremely" to prevent floor or ceiling effects. Valence and arousal have been used in previous ESM studies on emotion regulation as they are considered to represent an economic way to assess emotional states (e.g. Kuppens et al., 2010).

Harmfulness evaluations of emotions were assessed via a newly developed item (see Figure 1).

Evaluations of personal resources to regulate emotions were assessed via newly developed items (see Figure 1).

Intercorrelations between all types of emotion evaluations are presented in online supplementary Table 1. Evaluations of personal resources to accept and tolerate were highly correlated. Therefore, we averaged these two types of evaluations to a single variable named evaluations of personal resources to accept/tolerate.

The use of emotion regulation strategies was assessed with a single-choice list of eight items created for the purpose of this study based on the Heidelberg Form for Emotion Regulation Strategies (Izadpanah et al., 2019) and the Emotion Regulation Skills Questionnaire (Berking & Znoj, 2008) and complemented with two items to assess that no strategy was employed (see Figure 1).

Statistical analyses

Statistical analyses were run with IBM SPSS Statistics (version 25). To account for the hierarchical structure of the ESM data, we calculated multilevel random-intercept, fixed-slope multinomial models with assessment points (level 1) nested within individuals (level 2) applying a logit link function and a heterogeneous autoregressive covariance structure. To investigate the hypothesised longitudinal associations, we tested moment-to-moment associations between the independent variables measured at t and the dependent variable measured at $t+3$ min. Independent variables were the continuous predictors of harmfulness evaluations and evaluations of personal
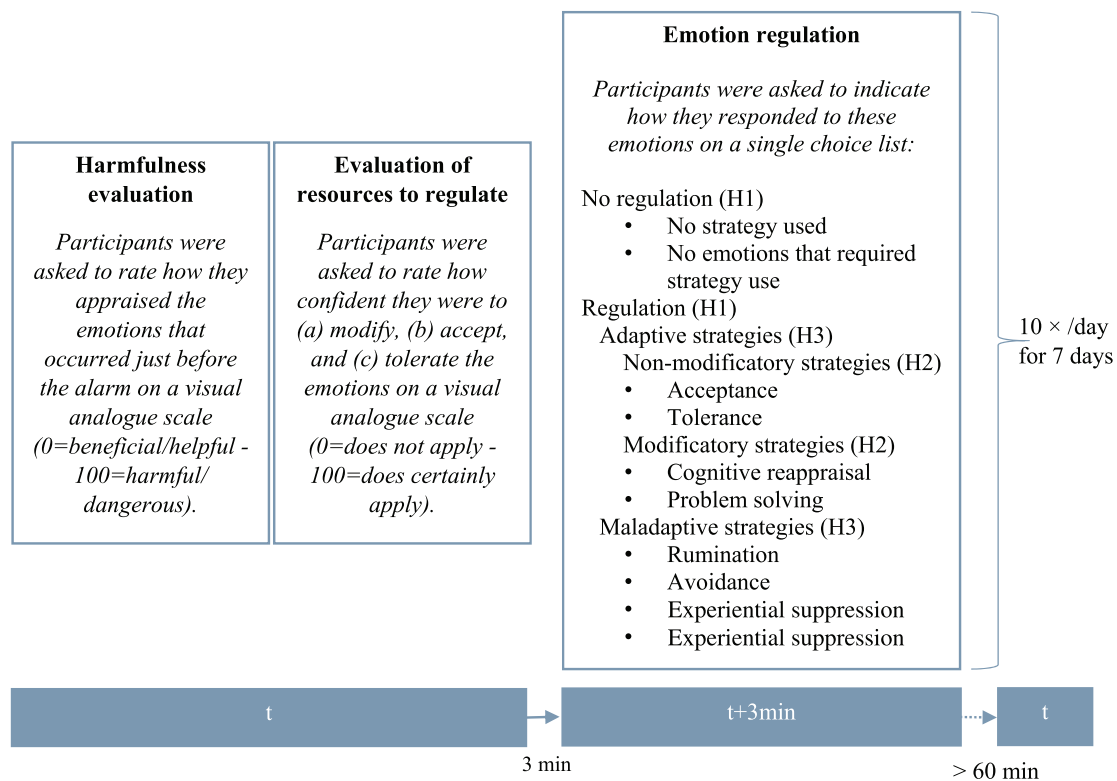
Figure 1. Design of the experience-sampling method assessment.

Note: H1, H2, H3 = Hypothesis 1, 2, 3. Formulations of items describing emotion regulation strategies were: Acceptance ("I tried to accept my emotions"), tolerance ("I tried to tolerate my emotions"), cognitive reappraisal ("I tried to change my emotions by thinking differently about the situation"), problem solving ("I thought about solutions to changing the situation"), rumination ("I thought intensively about what I have done or said in the situation in order to understand my emotions better"), avoidance ("I tried to avoid thoughts about things that distress me"), suppression of the emotional experience ("I tried not to allow my emotions"), expressive suppression ("I tried not to show my emotions in front of others"), no strategy used ("I applied no strategy to deal with the emotions"), no emotion that required strategy use was present ("I had no emotions that I had to deal with").

resources to modify and accept/tolerate. The dependent variables were the categories of regulation versus no regulation (model 1, hypothesis 1), modificatory versus non-modificatory strategies (model 2, hypothesis 2), and maladaptive versus adaptive strategies (model 3, hypothesis 3). Thus, the models predicted the probability of one selected outcome category coded as 1 versus a reference category coded as 2. Figure 1 depicts the items included in each model. Those items that were not part of the selected outcome category or the reference category in a model were subsumed under a residual category. This residual category was included as a third category of the dependent variable in the multinomial comparison but was not relevant for our hypotheses and is therefore not reported. The independent variables were entered simultaneously and person-mean centred. The sample size calculation was guided by the recommended sample sizes in

multilevel models (Ali et al., 2019) and oriented at previous ESM studies on emotion regulation (e.g. Ortner & Pennekamp, 2020). Effect sizes were calculated as Odds Ratios (*OR*) based on standardised predictors. Negative affect has been found to predict the use of certain emotion regulation strategies (e.g. Lennarz et al., 2019). Thus, we included affective valence and arousal as control variables to examine whether emotion evaluations predicted strategy use beyond the influence of the emotion per se.

Results

Sample characteristics

Of $n = 136$ recruited participants, 9 dropped out before the ESM assessment. In line with other ESM studies (e.g. Thewissen et al., 2011), we excluded participants with less than 30% available ESM data ($n = 9$),

which was due to either insufficient compliance or technical problems. The final sample used in the analyses consisted of $n = 118$ participants. The compliance rate was 82.39% on average (range: 30–100%), which corresponds to compliance rates found in other ESM studies (e.g. Vachon et al., 2019). Mean age was 31.40 ($SD = 11.78$), 75% of participants were female, 1.7% non-binary, 53.4% were students, mean years of education were 16.5 ($SD = 4.10$). In the baseline questionnaire, which was completed by 116 participants, 30 self-reported one or more lifetime diagnoses of a mental disorder (depression: $n = 20$, anxiety disorder: $n = 8$, eating disorder: $n = 2$, obsessive compulsive disorder: $n = 2$).

Preliminary analyses

Means and standard deviations of harmfulness evaluations and evaluations of personal resources to modify and accept/tolerate preceding each specific emotion regulation strategy and the frequencies of all options to deal with an emotion are displayed in online supplementary Table 2.

Main analyses

Model 1 revealed that greater harmfulness evaluations at t significantly predicted the use of regulation strategies (versus using no regulatory strategy) at $t+3$ min while controlling for affective valence and arousal at t (see Table 1).

Model 2 showed no significant effect for the predictors of evaluation of personal resources to modify and to accept/tolerate at t for modificatory strategy use (versus non-modificatory strategy use) at $t+3$ min while controlling for affective valence and arousal (see Table 1).

Model 3 showed that the hypothesised interaction effects between harmfulness evaluations and evaluations of personal resources to accept/tolerate and to modify were non-significant (see Table 1). However, greater harmfulness evaluations at t significantly predicted maladaptive strategy use at $t+3$ min and evaluations of less sufficient personal resources to accept/tolerate at t significantly predicted maladaptive strategy use at $t+3$ min while controlling for affective valence and arousal. Evaluations of personal resources to modify at t did not have a significant effect on maladaptive strategy use at $t+3$ min.

Additional analyses

A series of sensitivity analyses confirmed the robustness of our findings (see online supplementary files).

Discussion

As expected, irrespective of the momentary affect, the more harmful individuals rated an emotion, the more

Table 1. Multinomial logistic regression analysis with independent variables harmfulness evaluations, evaluations of resources to modify, and evaluations of resources to accept/tolerate at t and the dependent variable strategy use with respective categories at $t+3$ min controlling for affective valence and arousal.

	B	SE	95% CI	p	ß	OR [95% CI]
Model 1: Regulation (vs no regulation)						
Harmfulness evaluations	0.021	0.003	[0.016, 0.027]	<.001	.362	1.436 [1.304, 1.582]
Valence	−0.015	0.002	[−0.019, −0.010]	<.001	-.284	0.753 [0.687, 0.825]
Arousal	0.015	0.002	[0.011, 0.019]	<.001	.304	1.356 [1.241, 1.481]
Model 2: Modificatory (vs non-modificatory)						
Evaluations of resources to modify	0.005	0.003	[0.000, 0.011]	.068	.096	1.101 [.993, 1.220]
Evaluations of resources to accept/tolerate	−0.005	0.004	[−0.012, −0.002]	.155	-.077	0.926 [0.833, 1.029]
Valence	−0.011	0.003	[−0.017, −0.005]	<.001	-.217	0.805 [0.719, 0.901]
Arousal	0.008	0.003	[0.002, 0.013]	.005	.159	1.172 [1.050, 1.308]
Model 3: Maladaptive (vs adaptive)						
Harmfulness evaluations	0.011	0.003	[0.005, 0.017]	<.001	.184	1.202 [1.082, 1.335]
Evaluations of resources to modify	0.004	0.003	[−0.001, 0.009]	.095	.080	1.084 [.986, 1.190]
Evaluations of resources to accept/tolerate	−0.016	0.003	[−0.022, −0.009]	<.001	-.235	0.791 [0.720, 0.869]
Harmfulness × resources to modify	0.000	0.000	[0.000, 0.000]	.323	-.031	0.969 [0.910, 1.031]
Harmfulness × resources to accept/tolerate	0.000	0.000	[0.000, 0.000]	.092	.049	1.050 [.992, 1.112]
Valence	−0.002	0.003	[−0.007, 0.004]	.534	-.033	0.967 [0.871, 1.074]
Arousal	−0.004	0.003	[−0.009, 0.002]	.176	-.072	0.931 [0.839, 1.033]

Note: CI = confidence interval, OR = Odds Ratios, Harmfulness = Harmfulness Evaluations, Resources to Modify = Evaluations of Resources to Modify, Resources to Accept/Tolerate = Evaluations of Resources to Accept/Tolerate.
OR were calculated based on standardised predictors.

likely they were to engage in regulatory efforts. Hence, what people thought about an emotion was related to the way they regulated it beyond the quality of the emotion itself. This clearly corroborates our theory (Nowak et al., 2021) and is further in line with the process model (Gross, 2015), which postulates that an evaluation of an emotion activates the goal to regulate and thereby motivates emotion regulation. Although harmfulness evaluations have been theoretically linked to the process model, so far there is little research on whether they are associated with emotion regulation (Ford & Gross, 2018). On 45% of the measurement occasions, our participants reported to have used no regulation strategy. That is, they experienced no considerable emotion or they decided not to regulate despite experiencing an emotion. On these occasions, it is conceivable that auto-regulation terminated emotions via psycho-physiological processes or via behaviours that altered the emotion eliciting situation (Kappas, 2011; Yih et al., 2019). The frequencies of strategy use were similar to those reported in previous studies (Heiy & Cheavens, 2014; Lennarz et al., 2019).

Our second question was whether evaluations of personal resources to modify an emotion and evaluations of personal resources to accept/tolerate predict the use of (non-) modificatory strategies. We found that when people rated their resources to modify as sufficient, this was not associated with a higher likelihood of using cognitive reappraisal or problem-solving over acceptance or tolerance. Also, rating personal resources to accept/tolerate as sufficient did not have an effect on the preference of non-modificatory strategies – when controlling for affective valence and arousal. However, in our sensitivity analyses, additionally controlling for gender or loaned versus private smartphone, we found tentative evidence that evaluations of resources to modify emotions do predict modificatory over non-modificatory strategy use. Hence, it might be worthwile investigating this hypothesis further, for example in more gender-balanced samples. Importantly, the evaluations of resources to modify and to accept/tolerate were moderately correlated and overall rather high in our sample. This indicates that individuals often perceived themselves as capable to regulate either way and then decided between modificatory versus non-modificatory strategies based on other factors (cf. Tamir, 2021). Given that the selected strategy was mostly acceptance and seldom cognitive reappraisal (for similar findings, see Heiy & Cheavens,

2014; Lennarz et al., 2019), one of these factors may be the costs associated with a given strategy. Whereas acceptance has been hypothesised to be employed with relative ease (c.f. Lennarz et al., 2019), cognitive reappraisal has been found to be associated with high mental effort (for a review, see Tamir, 2021). This might also explain why Ortner and Pennekamp (2020) found increases in cognitive reappraisal particularly for events participants considered as important.

The third question we focused on was which emotion evaluations predict the use of maladaptive strategies, which were applied on 14% of measurement occasions, versus adaptive strategies, which constituted around 41% of the regulatory attempts. We found that an evaluation as more harmful and an evaluation of insufficient resources to accept/tolerate both were associated with a higher likelihood of using maladaptive strategies. These effects were independent of momentary affect. However, the hypothesised interaction was not significant. Hence, evaluations of sufficient resources neither weakened the association between harmfulness evaluations and emotion regulation (cf. manageable challenge), nor were evaluations of insufficient resources associated with a higher chance of the subsequent use of maladaptive strategies when individuals also evaluated an emotion as harmful (cf. unmanageable threat). Instead, our findings suggest that individuals draw on maladaptive strategies in the face of a putatively harmful emotion independent of their perceived resources to deal with it in an adaptive way. A similar pattern of results was found by Karnaze and Levine (2018). Their interpretation was that evaluating an emotion as harmful prevents individuals from attending to that emotion and therefore from understanding its origins, which complicates the use of adaptive strategies.

Our participants were also more likely to use maladaptive strategies when they evaluated their resources to accept/tolerate as insufficient, independent of how harmful they rated the emotion. Although we expected an interaction, it is reasonable to infer that evaluations of resources to accept/tolerate are related to emotion regulation via an independent route. Accordingly, Naragon-Gainey et al. (2017) found that distress tolerance was positively associated with acceptance and negatively associated with emotional avoidance and rumination. This suggests that when people lack the ability to tolerate the distress associated with an emotion, they are more

likely to use emotional suppression or to focus on perseverative negative thoughts in order to avoid the underlying emotion (cf. Naragon-Gainey et al., 2017). Similarly, Sydenham et al. (2017) found that beliefs about emotions as unacceptable were associated with emotional avoidance. Together with our findings, this implies that when people think they are capable to accept and tolerate an unpleasant emotion without having to engage in control attempts, they are likely to use approach-oriented and adaptive regulation strategies. In contrast, when they think that they are unable to accept/tolerate an emotion, they are more likely to draw on maladaptive strategies in desperate attempts of not having to experience the emotion.

A limitation of our study is that due to the ESM we had to find an economical way of assessing emotion evaluations, which may have come at the cost of reliability and validity. However, the intercorrelations between the items indicated sufficient validity. Moreover, participants could indicate only the most relevant strategy used at each observation, which does not capture possible multiple-strategy use (Ford et al., 2019). Furthermore, our design did not allow testing for a reverse directionality of effects, namely strategy use influencing subsequent emotion evaluations. ESM designs allowing for cross-lagged analyses and experimental studies could help to clarify directionality. It is also possible that assessments of emotion evaluations could have biased subsequent strategy use. For example, reports of resources to regulate could have made participants aware of those and thereby could have promoted using adaptive strategies. Furthermore, we used a novel design including a time interval of 3 min between t and $t+3$ min. Research into the temporal unfolding of emotion regulation is needed to enable optimal ESM designs. While our main result did not change when including random slopes in model 1, models 2 and 3 did not converge with random slopes. It may thus be helpful for future studies to test for differences in the strengths of relationships between emotion evaluations and emotion regulation across individuals. Some of our participants ($n = 21$) did not answer the recommended amount of items resulting in an overall insufficient n to detect small effects ($n > 50$ units per participant; cf. Ali et al., 2019). Thus, our analyses could have been underpowered to detect the hypothesised interaction effects. Finally, the sample was 75% female. Although controlling for gender

did not change our findings of model 1 and 3, this might explain our non-findings of model 2.

Taken together, our findings support both previous research (Ford & Gross, 2018) and our theory (Nowak et al., 2021) in showing that when people evaluate an emotion as harmful, they are substantially more likely to regulate it in a maladaptive way. Moving beyond previous research, we also showed that individuals are more likely to use maladaptive strategies when rating their personal resources to accept and tolerate that emotion as insufficient. As we did not find an interaction here, it seems that both types of evaluations independently foster maladaptive regulation.

Thus, we can speculate about a vicious cycle of emotion regulation and appraisals. Emotion regulation strategies influence emotions via altered appraisals of the world. For example, reappraising an eliciting situation can reduce or even end a negative emotion (cf. Yih et al., 2019), whereas ruminating about an event is likely to maintain a negative emotion via a perseverative engagement with negative thought content. In this case, we would expect individuals to evaluate these emotions as more harmful and their resources to respond to them as less sufficient, which would motivate the use of maladaptive strategies. Our findings may furthermore help to resolve a paradox in the field of emotion regulation and psychopathology. The paradox is that whereas people with mental disorders apply regulation strategies successfully following instructions in the laboratory, they report to use less adaptive and more maladaptive regulation strategies than healthy controls in cross-sectional studies (for a review, see Liu & Thompson, 2017). Thus, despite being able to apply adaptive strategies, they frequently use maladaptive strategies. It has already been shown that people with mental disorders evaluate their emotions in a more negative manner (for a meta-analysis, see Yoon et al., 2018). Our findings indicate that these negative evaluations might explain why they do not resort to adaptive strategies despite being able to apply them. For clinical practice, this indicates that rather than primarily focusing on the implementation of emotion regulation strategies, a stronger emphasis on harmfulness evaluations and evaluations of personal resources to accept and tolerate could be helpful to foster adaptive emotion regulation. Specifically, normalising emotional experiences rather than stigmatising them as pathological, cognitively working on automatic evaluations as harmful, and

supporting patients in becoming aware of their resources to accept and tolerate emotions could be promising.

Note

1. Following the logic of our theory here, we will only consider adaptive strategies under the categories of modificatory and non-modificatory strategies, although some maladaptive strategies might also aim to change an emotion.

Data availability statement

Datasets described in this paper are available from the corresponding author on request.

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Online Supplement Studie II

Supplementary Table 1

Within- and Between Participant Correlations of Harmfulness Evaluations with Evaluations of Resources to Modify, to Accept, and to Tolerate

	1		2		3	
	within	between	within	between	within	between
1. Harmfulness evaluations	–	–				
2. Evaluations of resources to modify	-.23	-.34	–	–		
3. Evaluations of resources to accept	-.44	-.51	.32	.54	–	–
4. Evaluations of resources to tolerate	-.38	-.46	.40	.53	.69	.97

Note. Harmfulness evaluation: 0=helpful – 100=harmful, evaluation of personal resources:

0=no resources to regulate – 100=sufficient resources to regulate. Intercorrelation coefficients

were calculated with Mplus (Version 5, Muthén & Muthén, 2007).

Supplementary Table 2

Means and Standard Deviations of Emotion Evaluations Before Each Emotion Regulation Strategy Was Used and Overall, and Frequencies of Strategy Use

Emotion regulation strategies	Preceding harmfulness evaluation M (SD)	Preceding evaluation of resources to regulate M (SD)		Frequencies of strategy use (%)
		Modification	Acceptance/ tolerance	
Acceptance	26.31 (19.43)	61.79 (28.43)	79.74 (20.59)	1691 (25%)
Tolerance	42.68 (21.79)	52.43 (25.63)	66.22 (22.65)	393 (6%)
Cognitive reappraisal	38.09 (20.06)	58.37 (23.81)	73.20 (19.63)	159 (2%)
Problem-solving	40.51 (20.69)	60.32 (24.75)	70.51 (21.88)	557 (8%)
Rumination	37.11 (21.59)	59.55 (25.47)	74.19 (20.50)	113 (2%)
Avoidance	43.00 (21.56)	57.38 (25.17)	67.17 (23.13)	452 (7%)
Experience suppression	45.51 (26.71)	47.69 (28.72)	51.22 (26.27)	241 (4%)
Expressive suppression	36.95 (22.98)	54.13 (26.53)	62.92 (22.69)	91 (1%)
No Strategy used	31.79 (21.06)	58.18 (28.46)	75.96 (25.19)	1272 (19%)
No emotion that required regulation	21.14 (14.34)	67.00 (27.35)	83.37 (16.93)	1750 (26%)
Overall	30.52 (21.04)	60.66 (27.79)	76.01 (22.62)	6719 (100%)

Note. Harmfulness evaluation: 0=helpful –100=harmful, evaluation of personal resources: 0=no resources to regulate – 100=appropriate resources to regulate. Experience suppression=suppression of the emotional experience.

Supplementary Table 3

Multinomial Logistic Regression Analysis with Independent Variables Harmfulness

Evaluations, Evaluations of Resources to Modify, and Evaluations of Resources to

Accept/Tolerate at t and the Dependent Variable Strategy Use with Respective Categories at

t+3min Controlling for Affective Valence and Arousal, Including All Cases With > 0%

Available Data

	B	SE	95% CI	p	ß	OR [95% CI]
Model 1: Regulation (vs no regulation)						
Harmfulness evaluations	0.021	0.003	[0.016, 0.027]	<.001	.368	1.445 [1.313, 1.591]
Valence	-0.015	0.003	[-0.019, -0.010]	<.001	-.277	0.758 [0.692, 0.831]
Arousal	0.015	0.002	[0.011, 0.019]	<.001	.307	1.359 [1.245, 1.484]
Model 2: Modificatory (vs non-modificatory)						
Evaluations of resources to modify	0.005	0.003	[0.000, 0.011]	.068	.096	1.101 [0.994, 1.220]
Evaluations of resources to accept/tolerate	-0.005	0.004	[-0.012, 0.002]	.155	-.079	0.924 [0.832, 1.026]
Valence	-0.011	0.003	[-0.017, -0.005]	<.001	-.225	0.799 [0.714, 0.893]
Arousal	0.008	0.003	[0.002, 0.013]	.005	.146	1.158 [1.038, 1.291]
Model 3: Maladaptive (vs adaptive)						
Harmfulness evaluations	0.011	0.003	[0.005, 0.017]	<.001	-.284	1.198 [1.080, 1.329]
Evaluations of resources to modify	0.004	0.003	[-0.001, 0.009]	.095	-.152	1.027 [0.977, 1.177]
Evaluations of resources to accept/tolerate	-0.016	0.003	[-0.022, -0.009]	<.001	.182	0.794 [0.723, 0.872]
Harmfulness × resources to modify	0.000	0.000	[0.000, 0.000]	.244	-.031	0.965 [0.907, 1.027]
Harmfulness × resources to accept/tolerate	0.000	0.000	[0.000, 0.000]	.092	-.021	1.051 [0.993, 1.112]
Valence	-0.002	0.003	[-0.007, 0.004]	.534	.251	0.981 [0.884, 1.088]
Arousal	-0.004	0.003	[-0.009, 0.002]	.176	-.299	0.945 [0.853, 1.047]

Note. CI=confidence interval, Harmfulness=Harmfulness Evaluations, Resources to

Modify=Evaluations of Resources to Modify, Resources to Accept/Tolerate=Evaluations of

Resources to Accept/Tolerate.

OR were calculated based on standardized predictors.

Supplementary Table 4

Multinomial Logistic Regression Analysis with Independent Variables Harmfulness Evaluations,

Evaluations of Resources to Modify, and Evaluations of Resources to Accept/Tolerate at t and the

Dependent Variable Strategy Use with Respective Categories at t+3min Controlling for Gender,

Affective Valence, and Arousal

	B	*SE*	95% CI	*p*	*ß*	*OR* [95% CI]
Model 1: Regulation (vs no regulation)						
Harmfulness evaluations	0.021	0.003	[0.016, 0.027]	<.001	.364	1.439 [1.304, 1.589]
Gender	0.396	0.500	[-0.585, 1.378]	.429	.396	1.487 [0.557, 3.968]
Valence	-0.015	0.003	[-0.019, -0.010]	<.001	-.281	0.755 [0.688, 0.830]
Arousal	0.016	0.002	[0.011, 0.020]	<.001	.322	1.380 [1.260, 1.511]
Model 2: Modificatory (vs non-modificatory)						
Evaluations of resources to modify	0.006	0.003	[0.001, 0.012]	.028	.120	1.127 [1.013, 1.254]
Evaluations of resources to accept/tolerate	-0.006	0.004	[-0.013, 0.002]	.135	-.084	0.919 [0.823, 1.027]
Gender	-0.471	0.363	[-1.181, 0.240]	.194	-.471	0.625 [0.307, 1.271]
Valence	-0.012	0.003	[-0.018, -0.006]	<.001	-.233	0.792 [0.705, 0.890]
Arousal	0.008	0.003	[0.002, 0.013]	.005	.162	1.176 [1.050, 1.317]
Maladaptive (vs adaptive)						
Harmfulness evaluations	0.012	0.003	[0.006, 0.018]	<.001	.201	1.223 [1.098, 1.362]
Evaluations of resources to modify	0.005	0.003	[0.000, 0.010]	.070	.091	1.095 [0.993, 1.208]
Evaluations of resources to accept/tolerate	-0.015	0.003	[-0.022, -0.009]	<.001	-.227	0.797 [0.723, 0.879]
Harmfulness × resources to modify	0.000	0.000	[0.000, 0.000]	.277	-.035	0.965 [0.905, 1.029]
Harmfulness × resources to accept/tolerate	0.000	0.000	[0.000, 0.000]	.084	.052	1.053 [0.993, 1.117]
Gender	-0.947	0.332	[-1.589, -0.295]	.004	-.948	0.388 [0.202, 0.744]
Valence	-0.002	0.003	[-0.008, 0.003]	.397	-.046	0.955 [0.858, 1.063]
Arousal	-0.004	0.003	[-0.009, 0.001]	.121	-.085	0.919 [0.825, 1.023]

Note. CI=confidence interval, Harmfulness=Harmfulness Evaluations, Resources to

Modify=Evaluations of Resources to Modify, Resources to Accept/Tolerate=Evaluations of

Resources to Accept/Tolerate.

OR were calculated based on standardized predictors.

Supplementary Table 5

Multinomial Logistic Regression Analysis. Model 1, Besides the Independent Variable

Harmfulness Evaluations Includes Evaluations of Resources to Modify, and Evaluations of

Resources to Accept/Tolerate at t. Model 2 also Includes Harmfulness Evaluations. Model 3

Was Calculated Without Interaction Terms. Affective Valence and Arousal Were Included as

Control Variables. The Dependent Variable Was Strategy Use with Respective Categories at

t+3min

	B	*SE*	95% CI	*p*	*ß*	*OR* [95% CI]
Model 1: Regulation (vs no regulation)						
Harmfulness evaluations	0.019	0.003	[0.013, 0.025]	<.001	.320	1.378 [1.248, 1.522]
Evaluations of resources to modify	0.009	0.002	[0.005, 0.013]	<.001	.168	1.183 [1.103, 1.269]
Evaluations of resources to accept/tolerate	-0.016	0.003	[-0.022, -0.011]	<.001	-.247	0.781 [0.718, 0.850]
Valence	-.013	0.003	[-0.018, -0.009]	<.001	-.259	0.772 [0.702, 0.848]
Arousal	.014	0.002	[0.009, 0.018]	<.001	.282	1.326 [1.213, 1.449]
Model 2: Modificatory (vs non-modificatory)						
Harmfulness evaluations	0.002	0.004	[-0.005, 0.010]	.499	.042	1.043 [0.923, 1.178]
Evaluations of resources to modify	0.005	0.003	[0.000, 0.011]	.065	.097	1.102 [0.994, 1.222]
Evaluations of resources to accept/tolerate	-0.005	0.004	[-0.012, 0.002]	.196	-.071	0.932 [0.837, 1.037]
Valence	-0.010	0.003	[-0.017, -0.004]	.002	-.198	0.820 [0.725, 0.929]
Arousal	0.007	0.003	[0.001, 0.013]	.014	.146	1.157 [1.029, 1.300]
Model 3: Maladaptive (vs adaptive)						
Harmfulness evaluations	0.010	0.003	[0.004, 0.016]	.002	.166	1.181 [1.065, 1.309]
Evaluations of resources to modify	0.004	0.002	[-0.001, 0.008]	.144	.065	1.068 [0.978, 1.165]
Evaluations of resources to accept/tolerate	-0.014	0.003	[-0.019, -0.008]	<.001	-.203	0.816 [0.748, 0.890]
Valence	-0.002	0.003	[-0.007, 0.003]	.479	-.038	0.963 [0.868, 1.069]
Arousal	-0.003	0.003	[-0.009, 0.002]	.180	-.071	0.932 [0.840, 1.033]

Note. CI=confidence interval, Harmfulness=Harmfulness Evaluations, Resources to

Modify=Evaluations of Resources to Modify, Resources to Accept/Tolerate=Evaluations of

Resources to Accept/Tolerate.

OR were calculated based on standardized predictors.

Supplementary Table 6

Multinomial Logistic Regression Analysis with Independent Variables Harmfulness Evaluations,

Evaluations of Resources to Modify, and Evaluations of Resources to Accept/Tolerate at t and the

Dependent Variable Strategy Use with Respective Categories at t+3min Controlling for Private

Versus Loaned Smartphone, Affective Valence, and Arousal

	B	*SE*	95% CI	*p*	*ß*	*OR* [95% CI]
Model 1: Regulation (vs no regulation)						
Harmfulness evaluations	0.021	0.003	[0.015, 0.026]	<.001	.351	1.420 [1.287, 1.567]
Smartphone (private)	0.431	0.500	[-0.549, 1.411]	.389	.431	1.539 [0.578, 4.101]
Valence	-0.015	0.003	[-0.020, -0.010]	<.001	-.286	0.751 [0.684, 0.825]
Arousal	0.015	0.002	[0.010, 0.019]	<.001	.305	1.356 [1.239, 1.485]
Model 2: Modificatory (vs non-modificatory)						
Evaluations of resources to modify	0.006	0.003	[0.000, 0.011]	.043	.108	1.114 [1.003, 1.237]
Evaluations of resources to accept/tolerate	-0.004	0.004	[-0.012, 0.003]	.252	-.064	0.938 [0.841, 1.046]
Smartphone (private)	-0.689	0.354	[-1.383, 0.005]	.052	-.689	0.502 [0.251, 1.005]
Valence	-0.011	0.003	[-0.017, -0.005]	<.001	-.217	0.805 [0.718, 0.903]
Arousal	0.008	0.003	[0.002, 0.013]	.005	.161	1.175 [1.051, 1.314]
Model 3: Maladaptive (vs adaptive)						
Harmfulness evaluations	0.011	0.003	[0.005, 0.017]	<.001	.189	1.208 [1.087, 1.344]
Evaluations of resources to modify	0.004	0.003	[-0.001, 0.009]	.119	.076	1.079 [0.981, 1.188]
Evaluations of resources to accept/tolerate	-0.015	0.003	[-0.022, -0.009]	<.001	-.229	0.795 [0.722, 0.876]
Harmfulness × resources to modify	0.000	0.000	[0.000, 0.000]	.320	-.032	0.969 [0.909, 1.032]
Harmfulness × resources to accept/tolerate	0.000	0.000	[0.000, 0.000]	.086	.051	1.052 [0.993, 1.115]
Smartphone (private)	-0.160	0.324	[-0.795, 0.475]	.622	-.160	0.852 [0.452, 1.608]
Valence	-0.002	0.003	[-0.007, 0.003]	.476	-.038	0.962 [0.866, 1.070]
Arousal	-0.004	0.003	[-0.009, 0.001]	.142	-.079	0.924 [0.832, 1.027]

Note. CI=confidence interval, Harmfulness=Harmfulness Evaluations, Resources to

Modify=Evaluations of Resources to Modify, Resources to Accept/Tolerate=Evaluations of

Resources to Accept/Tolerate.

73% of participants used loaned smartphones.

OR were calculated based on standardized predictors.

Supplementary Table 7

Multinomial Logistic Regression Analysis with Independent Variable Harmfulness Evaluations

at t and the Dependent Variable Strategy Use at t+3min Controlling for Affective Valence and

Arousal, Including Random Slopes

	B	*SE*	95% CI	*p*	*ß*	*OR* [95% CI]
Model 1: Regulation (vs no regulation)						
Harmfulness evaluations	0.023	0.005	[0.014, 0.032]	<.001	.391	1.479 [1.269, 1.724]
Valence	-0.019	0.004	[-0.026, -0.012]	<.001	-.358	0.699 [0.611, 0.799]
Arousal	0.014	0.003	[0.008, 0.021]	<.001	.292	1.340 [1.173, 1.530]

Note. CI=confidence interval, Harmfulness=Harmfulness Evaluations.

OR were calculated based on standardized predictors.

Models 2 and 3 did not converge with random slopes.

ORIGINAL ARTICLE

An Analysis of the Pattern of Adaptive Emotion Regulation Associated with Low Paranoid Ideation in Healthy and Clinical Samples

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Abstract

Background Research on emotion regulation and paranoid ideation has mostly focused on isolated regulation strategies and has remained largely inconclusive. According to the emotion regulation model by Berking and Whitley (in: Affect Regulation Training, Springer, New York 2014) successful modification or acceptance/tolerance of emotions requires an adequate comprehension (awareness, clarity, understanding) of emotions and adequate self-support.

Method Building on this model, we investigated whether comprehension and self-support strengthen the negative association between modification and acceptance/tolerance and paranoid ideation. In study 1, we examined the hypotheses cross-sectionally based on questionnaire data from a combined sample ($N = 125$) consisting of people with a psychotic disorder, people at risk of developing psychosis, and healthy controls. In study 2, we examined the same hypotheses longitudinally by employing the experience sampling method in people with clinically relevant psychopathology below diagnostic threshold ($N = 138$).

Results In study 1, the association between modification and paranoid ideation was not moderated by comprehension or self-support. However, comprehension and self-support moderated the association between acceptance/tolerance and paranoid ideation. In study 2, the interaction effect between comprehension and acceptance/tolerance on paranoid ideation was confirmed.

Conclusion The results indicate that comprehending and accepting/tolerating emotions could be protective against paranoid ideation.

Keywords Delusions · Schizophrenia · Coping · Interactions of emotion regulation strategies · ESM

In an influential model of psychosis, Garety et al. (2001) postulated that negative affect has a crucial influence on the interpretation of internal and external experiences and thereby significantly contributes to paranoid ideation. In support of this model, elevated levels of negative affect have been found to predict paranoid ideation in longitudinal studies (Fowler et al. 2012; Freeman et al. 2012; Lincoln et al. 2017a) and in studies based on the experience sampling

method (ESM) in samples with different levels of symptom severity (Ben-Zeev et al. 2011; Krkovic et al. 2018, 2020; Thewissen et al. 2011; Thiery et al. 2014). Moreover, an experimental manipulation of negative affect was shown to be associated with increases in paranoid ideation in the general population (Lincoln et al. 2010a, b) and negative affect mediated the impact of a social stressor on paranoid ideation in patients with a psychotic disorder (Freeman et al. 2015). In the face of this evidence for negative affect as a predictor of paranoid ideation, it stands to reason that difficulties in the regulation of negative affect play an important role in the formation of paranoid ideation.

Emotion regulation has been defined as a process comprising the monitoring, appraisal and modification of the quality, intensity, and duration of affective states (Thompson 1994). It has further been conceptualised as a set of regulation strategies. These strategies are often subdivided into those considered maladaptive, such as suppression

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(Campbell-Sills et al. 2006) and rumination (Nolen-Hoeksema et al. 2008), and those considered adaptive, such as cognitive reappraisal (John and Gross 2004) and acceptance (Flaxman et al. 2010). The assumption behind this subdivision is that maladaptive strategies will be positively, and adaptive strategies will be negatively associated with psychopathology (Aldao 2012). Associations with psychopathology, however, have only been robustly shown for the putatively maladaptive strategies, whereas findings on the association between adaptive strategies and overall psychopathology are heterogeneous (Aldao et al. 2010). A similar pattern of findings is evident in studies investigating emotion regulation strategies in psychosis (for a meta-analytic review see Ludwig et al. 2019). Although studies report a positive association between maladaptive strategies and positive psychotic symptoms overall, there is rather high heterogeneity in findings for adaptive strategies with only some studies reporting a significant negative association between cognitive reappraisal and positive psychotic symptoms and most studies reporting no significant association (Ludwig et al. 2019). This pattern of findings does not accord with the effective reduction of psychotic symptoms by means of clinical interventions that focus on conveying adaptive strategies, such as cognitive reappraisal and acceptance/tolerance (Cramer et al. 2016; Eichner and Berna 2016; Louise et al. 2018; Opoka et al. 2018). To resolve this paradox, it is necessary to improve our understanding of the conditions under which the use of putatively adaptive strategies can unfold their positive effect on paranoid ideation.

One way to do this is by taking a wider perspective on the process of emotion regulation. In most of the existing questionnaire studies, researchers have focused on isolated, putatively adaptive emotion regulation strategies and especially on cognitive reappraisal (Ludwig et al. 2019) without taking into account possible interactions with other strategies. This approach may be too narrow, because evidence from experimental and ESM studies suggests that individuals use various emotion regulation strategies simultaneously to deal with emotions (for a review, see Ford et al. 2019). Beyond that, adaptive combinations of regulatory strategies have been found to outperform both single strategy use and sequences of ineffective multiple strategies (Aldao et al. 2015; Bonanno and Burton 2013; Heiy and Cheavens 2014). Thus, taking combinations of strategies into account rather than focusing on isolated strategies is more likely to help us identify the nature of emotion regulation relevant to mental health and well-being.

A model of emotion regulation that takes this type of approach by focussing on the effective interplay of strategies is the adaptive coping with emotions model (ACE) put forward by Berking and Whitley (2014). This model includes (1) awareness, (2) clarity, (3) understanding the cause of an emotion, and (4) providing compassionate self-support

in handling an emotion. The model further discriminates between (5) a modificatory pathway, which includes modification strategies, such as cognitive reappraisal, positive refocusing and social sharing and (6) a non-modificatory pathway, which includes non-modificatory strategies, such as acceptance and tolerance. Awareness, clarity, and understanding of an emotion (1–3, which we will subsume as comprehension) and compassionate self-support (4, which we will shorten to self-support in the following) are stipulated to impact on the emotion regulation process indirectly by facilitating modification (5) and acceptance/tolerance (6; Berking and Whitley 2014). In support of this assumption, a cross-sectional study demonstrated the interaction of clarity and cognitive reappraisal to be negatively associated with PTSD symptoms (Boden et al. 2012) and an experimental study showed a moderating effect of self-support on the effect of cognitive reappraisal on depressive symptoms (Diedrich et al. 2016). Thus, taking these interactions into account might also inform our understanding of the nature of emotion regulation difficulties that drive psychotic symptoms, such as paranoid ideation.

This study aims to identify adaptive emotion regulation patterns that are negatively associated with and may be protective against paranoid ideation. We expect to find that comprehension and self-support will strengthen the negative association between paranoid ideation and modification (H1) and between paranoid ideation and acceptance/tolerance (H2). To ascertain the robustness of findings, the hypotheses were tested using data from two studies that focused on different levels of symptom severity and used different designs. Study 1 used a sample of people with psychotic disorders, a sample of participants with high risk to develop a psychotic disorder and healthy controls, while study 2 used a sample of people with clinically relevant psychopathology below diagnostic threshold. Study 1 used a cross-sectional design, while study 2 used a longitudinal design with ESM. Data from study 1 stems from of a larger project on emotion regulation in psychotic disorders (LI 1298/7-1). Study 2 uses baseline data from a project testing the effect of an emotion regulation training (Wittkamp and Lincoln 2020).

Study 1

Recruitment, Procedure, and Design of the Original Project

The original study included participants with psychotic disorders, anxiety disorders, those at risk of psychosis and healthy controls who were recruited via in- and outpatient clinics in Hamburg, advertisements in local newspapers, blackboards, and online platforms. Inclusion criteria were sufficient German language skills, an age between 18 and

65 years, IQ > 85, no current suicidality, no neurological disorders or dementia, no diagnosis of a bipolar disorder or substance dependence and the ability to provide informed consent. Participants completed questionnaires and neuropsychological tests and partook in a social exclusion paradigm and an emotion regulation paradigm on 2 separate days. The details of recruitment, selection criteria and study procedure have been published elsewhere (Lincoln et al. 2017b) along with the data related to the social exclusion paradigm. The project was approved by the Ethics Committee of the German Psychological Society.

Method

Participants

In this study, we utilized data from the participants with psychotic disorders (PD, $n = 60$), those at risk of psychosis (AR, $n = 25$) and the healthy controls (HC, $n = 40$) who had provided baseline questionnaire data on emotion regulation and paranoid ideation. PD fulfilled criteria for a psychotic disorder according to the Mini International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al. 1998) at the time of assessment or during the last 2 years. Alternatively, if the last psychotic episode was longer than 2 years ago, PD needed to have experienced at least two psychotic episodes in total and presently report either at least two symptoms with mild severity (cut-off ≥ 3) or at least one symptom with moderate severity (cut-off ≥ 4) on the positive or negative

symptom subscale of the Positive and Negative Syndrome Scale (PANSS; Kay et al. 1987). AR fulfilled at least one of three criteria for prodromal syndromes as defined in the Structured Interview for Prodromal Syndromes (SIPS; Miller et al. 2003) and did not fulfil criteria for PD. HC did not fulfil criteria for any present or past Axis I disorder according to M.I.N.I., had no first-degree relative with a psychotic disorder, were not taking any psychopharmacological medication, and did not fulfil AR criteria. Sample characteristics for the combined sample and subgroups are presented in Table 1.

Measures Used for this Study

Adaptive emotion regulation strategies were assessed with the German version of the Emotion Regulation Skills Questionnaire – Emotion Specific (ERSQ-ES; Ebert et al. 2013). The scale contains 12 items rated on a five-point Likert scale (0 = "not at all" to 4 = "always"), where the use of emotion regulation strategies is rated specific to emotions. To prevent potentially biased self-reports due to memory deficits that are typically found in the PD and AR subgroups (Brewer et al. 2005; Leavitt and Goldberg 2009), we used an interview format. Participants were asked to recall a situation in which they experienced a particular negative emotion (anxiety, anger, sadness, and shame) and were then instructed to rate to which extent they applied each of the regulatory strategies. The ERSQ-ES in its original structure with nine emotion-specific subscales was reported to have good validity and reliability (Ebert et al. 2013). In our analyses we

Table 1 Sample characteristics, means and standard deviations of emotion regulation strategies and paranoid ideation and comparisons between subgroups in study 1

Variable	Study 1						Study 2
	Psychosis group ($n = 60$)	At risk group ($n = 25$)	Healthy controls ($n = 40$)	Combined sample ($n = 125$)	Statistics for univariate Comparisons (F, χ^2)	Games Howell Post Hoc Tests	Subthreshold sample ($n = 138$)
Age	40.15 (11.66)	34.72 (14.05)	40.03 (10.78)	39.02 (12.00)	$F(2, 122) = 2.04$; n.s	n.s	36.33 (12.12)[e]
Gender (%female)	63%	72%	68%	66%	$\chi^2 = 0.63$, $df = 2$; n.s	n.s	75%[e]
Education in years	16.26 (4.09)[a]	16.48 (7.68)[b]	18.32 (4.08)[c]	16.98 (5.00)[d]	$F(2, 112) = 2.06$; n.s	n.s	17.07 (4.80)[e]
Comprehension	3.18 (0.63)	2.97 (0.65)	3.43 (0.44)	3.22 (0.60)	$F(2, 122) = 5.1$; $p < 0.01$	HC > AR ($p < 0.01$)	2.26 (0.77)
Self-Support	2.58 (0.84)	2.11 (0.85)	2.97 (0.84)	2.62 (0.89)	$F(2, 122) = 7.8$; $p < 0.01$	HC > PD,AR ($p < 0.001$)	2.17 (0.95)
Modification	1.82 (0.73)	1.48 (0.74)	2.45 (0.62)	1.95 (0.78)	$F(2, 122) = 16.96$; $p < 0.001$	HC > AR ($p < 0.001$)	1.77 (0.93)
Acc/Tol	2.36 (0.81)	2.12 (0.70)	2.96 (0.56)	2.51 (0.79)	$F(2, 122) = 12.77$; $p < 0.001$	HC > PD,AR ($p < 0.001$)	2.34 (0.81)
Paranoid Ideation	2.23 (1.04)	2.19 (0.76)	1.08 (0.12)	1.853 (0.96)	$F(2, 122) = 27.55$; $p < 0.001$	HC < PD,AR ($p < 0.001$)	2.00 (1.59)

Comprehension, Self-Support, Modification, Acceptance/Tolerance were measured with the Emotion Regulation Skills Questionnaire – Emotion Specific. Paranoid ideation was measured with the Paranoia Checklist 18 item version (study 1) and 3 item version (study 2)

Acc/Tol acceptance/tolerance, HC healthy controls, PD psychosis group, AR at risk group

[a]$n = 5$ missing cases

[b]$n = 3$ missing cases

[c]$n = 2$ missing cases

[d]$n = 10$ missing cases

[e]$n = 21$ missing cases

focused on the following subscales: comprehension, self-support, modification, and acceptance/tolerance. Comprehension was calculated as the mean score of awareness, clarity and understanding and showed good internal consistency (Cronbach's alpha = 0.86). Self-support, modification, and acceptance/tolerance also had acceptable internal consistencies across emotions (all Cronbach's alphas > 0.70). Thus, we used the average score across emotions for each subscale.

Paranoid ideation was assessed with a German version of the frequency scale of the Paranoia Checklist (PCL-18; Freeman et al. 2005). The PCL-18 consists of 18 items that are self-rated on a five-point Likert scale (1 = "rarely", 2 = "once a month", 3 = "once a week", 4 = "several times a week", 5 = "at least once a day"). In this study we used the mean scores (range 1–5). The German version of the PCL-18 has shown excellent internal consistency and good convergent validity in clinical and non-clinical samples (Lincoln et al. 2010a, b). In this study, Cronbach's alpha of the total scale was 0.96.

Statistical Analyses

Statistical analyses were conducted in SPSS (version 25) and were performed on the combined sample to represent different levels of paranoid ideation severity along the continuum of psychosis (see Table 1) and thereby to increase variance in paranoid ideation and test-power. As paranoid ideation was not normally distributed (skewness = 2.08, SE = 0.44, and kurtosis = 4.56, SE = 0.088), we applied bootstrapping based on 1000 samples. A multiple regression analysis with forced entry was conducted with paranoid ideation as the dependent variable and four strategies of emotion regulation (comprehension, self-support, modification, and acceptance/tolerance) along with their interactions as independent variables. Independent variables were centred around their grand mean. The interaction graphs were created based on predicted mean values calculated with the PROCESS macro (Hayes 2017). We found the missing data in the emotion regulation assessments (0.6%) to be missing completely at random according to Little's MCAR test, χ^2 (409) = 454.07, $p = 0.061$. We therefore used the expectation maximization algorithm (Dempster et al. 1977) for imputation.

Results

Descriptive Statistics

Table 1 provides an overview of descriptive statistics of emotion regulation and paranoid ideation in each subgroup and the combined sample and statistical comparisons between subgroups. HC had significantly lower levels of paranoid ideation than AR and PD. AR and PD did not differ in this regard.

Regression Analysis for the Association of Emotion Regulation Strategies and Paranoid Ideation

Hypothesis 1*:* As shown in Table 2, modification was negatively associated with paranoid ideation, but this association was not moderated by comprehension or self-support.

Hypothesis 2*:* There were significant interaction effects of acceptance/tolerance and comprehension as well as acceptance/tolerance and self-support on paranoid ideation (see Table 2). As can be seen in Fig. 1a, paranoid ideation was lower for individuals who were high in acceptance/tolerance who also had high comprehension of their emotions as well, in comparison to those who were high in acceptance/tolerance but low in comprehension. Statistically, this was significant at t (124) = 3.64, $p < 0.001$, $d = 0.33$. More precisely, the interaction accounted for an approximate 1-point difference in the mean rating of the frequency of paranoid ideation that varied from 1 (rarely) to 5 (at least once a day). Paranoid ideation was comparably low for individuals who were low in both acceptance/tolerance and comprehension, compared to individuals who scored high on both strategies. Figure 1b shows that the paranoid ideation score was lower for individuals who had low acceptance/tolerance but scored high on self-support than for those who were high in both acceptance/tolerance and self-support; t (124) = 3.49, $p < 0.001$, $d = 0.31$. Finally, participants who had low acceptance/tolerance but high self-support had lower paranoid ideation than individuals who scored low on both strategies; t (124) = 3.86, $p < 0.001$, $d = 0.35$. This difference was illustrated by a 1-point mean difference in the mean rating of the frequency of paranoid ideation that varied from 1 (rarely) to 5 (at least once a day).

Additional Analyses

Due to a relatively high proportion of female participants in our sample, we conducted a reanalysis controlling for gender (see Table A1 in the Online Appendix). In this analysis, modification was no longer directly associated with paranoid ideation.

To assure the robustness of our findings using the imputed data, we further repeated the calculations constraining the analysis to complete cases. There were no differences between imputed and complete case results (see Table A2 in the Online Appendix).

Table 2 Study 1: multiple regression analysis for emotion regulation strategies as independent variables and paranoid ideation as dependent variable

Variable	B	SE	95% CI[a]	p
Modification	− 0.35	0.15	[− 0.67, − 0.05]	0.028
Acceptance/tolerance	0.06	0.16	[− 0.22, 0.38]	0.677
Self-support	− 0.11	0.14	[− 0.44, 0.13]	0.407
Comprehension	− 0.08	0.21	[− 0.45, 0.36]	0.724
Modification × self-support	− 0.07	0.22	[− 0.47, 0.46]	0.746
Modification × comprehension	0.21	0.39	[− 0.75, 0.87]	0.623
Acceptance/tolerance × self-support	0.48	0.20	[0.01, 0.82]	0.019
Acceptance/tolerance × comprehension	− 0.76	0.32	[− 1.30, − 0.04]	0.019

CI confidence interval

$R^2 = 0.20$

[a]Confidence interval per bootstrap with 1.000 samples
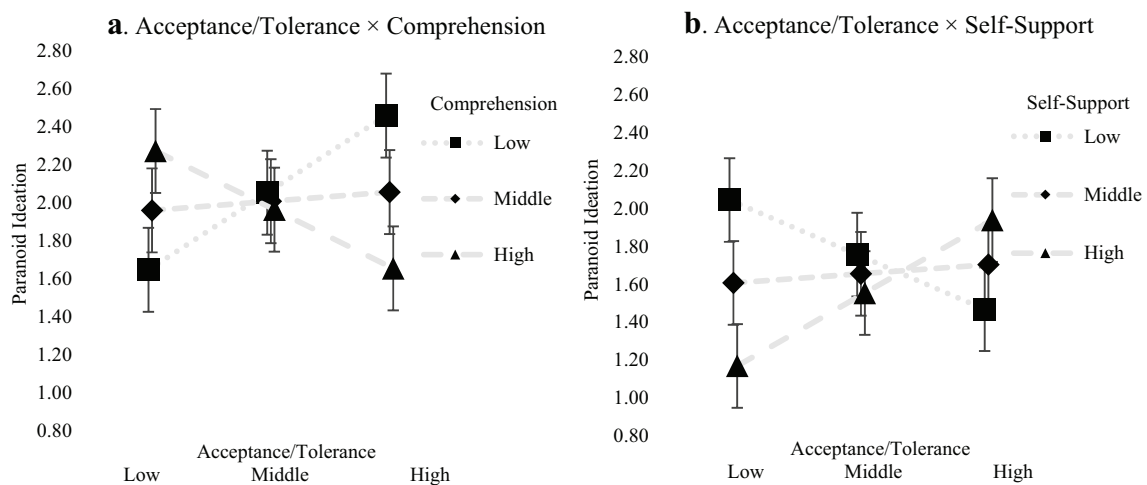
Fig. 1 Interaction effects between acceptance/tolerance and comprehension (**a**) and acceptance/tolerance and self-support (**b**). Predicted level of paranoid ideation (PCL-18) for combinations of acceptance/tolerance and moderators (ERSQ-ES) at one *SD* below, above and at the mean. Error bars indicate the standard error of the predicted mean. Lines only serve for better readability

Study 2

Recruitment, Procedure, and Design of the Original Project

Participants were recruited via online platforms, newsletters, leaflets, and posters in public spaces in Hamburg, Germany. Inclusion criteria were sufficient German language skills, an age between 18 and 65 years and the presence of clinically relevant, subthreshold psychopathology in at least one symptom domain (positive psychotic, negative psychotic symptoms, depressive, anxiety or phobic symptoms) indicative of an increased risk to develop a psychotic disorder (for theoretical reviews on the transdiagnostic expression of risk to develop psychotic disorders, see Fusar-Poli et al. 2014; Van Os and Reininghaus 2016).

Specific inclusion criteria were symptom frequency and distress deviating from the norm in any of the three subdomains of the Community Assessment of Psychic Experiences (CAPE; Stefanis et al. 2002: frequency ≥ 31 and distress ≥ 24 for positive psychotic symptoms, frequency ≥ 31 and distress ≥ 26 for negative psychotic symptoms, or frequency ≥ 17 and distress ≥ 18 for depressive symptoms) or in the anxiety or phobic subdomain of the Brief Symptom Inventory (BSI; Franke and Derogatis 2000: anxiety symptoms ≥ 0.68 or phobic symptoms ≥ 0.39). Exclusion criteria were current psychological treatment and the diagnosis of a current Axis I or Axis II disorder (specific phobia was not an exclusion criterion due to its high prevalence and relatively minor distress; Comer et al. 2011) as diagnosed with the Structured Clinical

Interview for DSM-IV (SCID; German version: Wittchen et al. 1997).

The study was a two-armed, randomized-controlled trial comparing an 8-week emotion regulation group training to self-help bibliotherapy. Participants were pre-screened for eligibility via online-questionnaires and followed-up by a face-to-face assessment including diagnoses assessment. Before being allocated to the intervention or the control group participants underwent a baseline assessment that included a socio-demographic assessment, clinical questionnaires, and a 1-week ESM assessment of negative emotions, emotion regulation, and paranoid ideation. In this study, we used the ESM data on negative emotions, emotion regulation, and paranoid ideation from the combined intervention and control group. A detailed description of the procedure and data on the efficacy of the intervention will be published elsewhere (Wittkamp and Lincoln 2020). The study was approved by the local Ethics Committee of the University of Hamburg.

Method

Participants

The final sample consisted of $N = 138$ participants. Sample characteristics are presented in Table 1. After the baseline ESM assessment but before baseline questionnaires, 21 participants dropped out from the study, resulting in missing data for age, gender, and years of education for these participants.

ESM

The ESM was administered via movisens XS Version 1.5.0 (movisens GmbH, Karlsruhe, Germany) on participants' private smartphones or on the study-smartphones. Participants were provided with a detailed explanation and examples of items along with an instruction sheet. Within the ESM assessment, over a period of six consecutive days, five times per day between 9 am and 10 pm, participants were notified with signal contingent, random time sampling (Wheeler and Reis 1991) with minimum time gaps of 1.5 h in between notifications. At each notification, participants were first asked to rate the intensity of each of a pre-defined list of negative emotions experienced just before the notification, then to select the negative emotion with the highest intensity just before the notification and to indicate the emotion regulation strategies they had used for that negative emotion. This was followed by a brief assessment of paranoid ideation experienced just before the notification.

Measures Used in the ESM

The negative emotions anxiety, sadness, anger, shame, insecurity, and loneliness were each rated in their intensity on an 11-point self-report Likert scale (0 = "not at all" to 10 = "very strong"). The scale demonstrated good internal consistency between individuals (Cronbach's alpha = 0.84) so we used the mean score of all negative emotions as a coefficient of negative emotions.

Adaptive emotion regulation strategies were assessed with the German version of the ERSQ-ES (Ebert et al. 2013) that we adapted for the ESM. At each notification, participants reported the use of regulatory strategies on a five-point Likert scale (0 = "does not apply at all" to 4 = "fully applies") specific to the emotion that they had rated as most intensive (anxiety, sadness, anger, shame, insecurity, or loneliness). The 12 items used in the original form of the ERSQ-ES were slightly adapted to ensure that they referred to the emotion experienced and the regulation strategy applied before the notification (e.g., modification: *In the situation just before the beep, I was able to influence my anxiety*). Comprehension was calculated as the mean value of awareness, clarity, understanding and demonstrated excellent internal consistency between individuals (Cronbach's alpha = 0.90). Self-support, modification, and acceptance/tolerance, in our sample, also showed good internal consistency between individuals and across emotions (all Cronbach's alphas > 0.88). Thus, we used the individual subscales averaged across emotions.

Paranoid ideation was assessed with the German, three-item version of the PCL (PCL-3; Schlier et al. 2016). The included items ("I need to be on my guard against others", "People try to upset me", and "Strangers and friends look at me critically") have been shown to be valid and change-sensitive (Schlier et al. 2016). Items were rated on an 11-point Likert scale (0 = "not at all", 10 = "very much"). Due to non-normality of the data, the scale was dichotomized to presence (= 1) or absence (= 0) of paranoid ideation.

Statistical Analyses

Statistical analyses were run with IBM SPSS Statistics (version 25). To account for the hierarchical data structure, we conducted time-lagged multilevel binomial probit regression analyses with random intercept and random slopes. Independent variables (comprehension, self-support, modification, and acceptance/tolerance) were centered around the person mean. To allow for chronological inferences regarding the association between emotion regulation and paranoid ideation, we used measurements of emotion regulation at a given time-point (t) to predict paranoid ideation at the following measurement point (t + 1). To ensure that emotions that required regulation were

present, solely measurements with negative emotions > 0 at t were included. Overnight lags were excluded. To test whether emotion regulation at t had an impact on paranoid ideation at t + 1 beyond the effect of preceding negative emotions and paranoid ideation, we controlled for negative emotions and paranoid ideation at t. For the interaction graph, we used mean values calculated based on predicted probabilities for paranoid ideation, which were defined by combinations of comprehension and acceptance/tolerance each at three different levels: < 1 SD below (= low), > 1 SD above (= high) and between > 1 SD below and > 1 SD above (= middle) its mean (see Fig. 2).

Results

Descriptive Statistics

Three participants were excluded from the analyses due to insufficient compliance with the ESM (> 90% missing data). After exclusion of these cases, the average compliance rate was 78.47% (range: 10–100%). This corresponds to compliance rates found in other ESM studies (Silvia et al. 2013). Paranoid ideation was present on 48% of measurement points and negative emotions were present (intensity > 0) on 80% of the measurement points.

Emotion Regulation Strategies at t as Predictors of Paranoid Ideation at t + 1 While Controlling for Paranoid Ideation and Negative Emotions at t

Results from the regression analysis can be seen in Table 3. Modification at t significantly predicted paranoid ideation at t + 1. There was no significant relationship between acceptance/tolerance at t and paranoid ideation at t + 1.

Hypothesis 1: There were no significant interaction effects, neither between modification and comprehension at t nor between modification and self-support at t on paranoid ideation at t + 1.

Hypothesis 2: The interaction of acceptance/tolerance and comprehension at t predicted a decreased likelihood to experience paranoid ideation at t + 1. As can be seen in Fig. 2a, the predicted probability for paranoid ideation at t + 1 was lower when comprehension was moderate or high at t and acceptance/tolerance was high at t than it was when acceptance/tolerance was high and comprehension was low; $t(85) = 2.08$, $p < 0.05$., $d = 0.44$. Specifically, the chances of experiencing paranoid ideation at t + 1 were decreased by 13% when comprehension was moderate or high at t. There was no significant effect of interaction between acceptance/tolerance at t and self-support at t on paranoid ideation at t + 1 (see Fig. 2b).
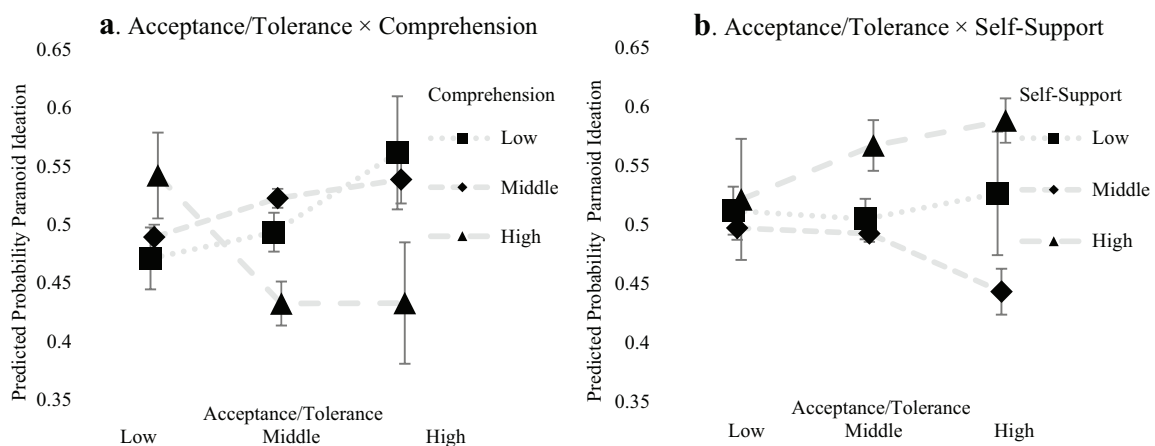
Fig. 2 Interaction effects between acceptance/tolerance and comprehension (**a**) that was significant, and acceptance/tolerance and self-support (**b**) that was not significant. Predicted probability of paranoid ideation (PCL-3) at t + 1 for measures with combinations of acceptance/tolerance and comprehension or self-support (ERSQ-ES) < 1 *SD* below (= low), > 1 SD above (= high) and between > 1 *SD* below and > 1 SD above (= middle) the mean value of comprehension, self-support, or acceptance/tolerance as measured at t. Error bars represent standard errors of the mean. Lines only serve for better readability

Additional Analyses

To ascertain the robustness of our findings we did a reanalysis excluding four participants with less than 70% data available in the ESM. The main findings did not differ from those found in our original analysis in which we took we took the less conservative approach by excluding participants with less than 90% data available (see Table A3 in the Online Appendix).

Discussion

In the present study we investigated links between the interplay of adaptive emotion regulation strategies and paranoid ideation.

Modification as a Predictor of Paranoid Ideation and Moderating Effects of Comprehension and Self-support

We predicted that an adequate comprehension and self-support would strengthen the negative association between modification and paranoid ideation. However, in *study 1*, there was a direct association between modification and paranoid ideation that was not moderated by comprehension or self-support. In *study* 2, modification predicted subsequent paranoid ideation and this effect was also not moderated by comprehension or self-support. Hence, although modification and paranoid ideation were negatively associated in both studies, this association was independent of other emotion regulation strategies. This is surprising, given the ACE model's assumption that comprehension of emotions and self-support lead to a more focused and targeted attempt to modify emotions (Berking and Whitley 2014) that has been partially confirmed in previous research (e.g. Boden

et al. 2012; Diedrich et al. 2016; Kalokerinos et al. 2019). However, these previous studies have mostly tested moderating effects specifically for cognitive reappraisal rather than for modification in general, which might explain the diverging findings. Another explanation for not detecting moderating effects in both studies is that the nature of the association might be more complex than a mere moderation. Interestingly, Berking et al. (2012) found an indirect effect between comprehension, self-support, and psychopathology via modification. Thus, it is conceivable that comprehension and self-support constitute prerequisites for the application of modification. Taken together, cross-sectionally as well as longitudinally modification seems to be protective against paranoid ideation. However, the underlying mechanisms remain to be disentangled in future research.

Acceptance/Tolerance as a Predictor of Paranoid Ideation and the Moderating Effect of Comprehension

Our expectation that the association between acceptance/tolerance and paranoid ideation would be moderated by comprehension was confirmed. In *study 1*, we found that participants with a strong ability to accept and tolerate, along with a better understanding of their emotions, reported considerably less paranoid ideation than those who were high in acceptance and tolerance but reported low understanding of their emotions. The finding from *study 2* confirmed this pattern by showing that when participants adequately accepted and understood their emotions, the likelihood of experiencing subsequent paranoid ideation was lower than when participants accepted their emotion without adequately understanding it. This is in line with what we had expected based on the ACE model. These observations further corroborate previous experimental research finding participants with lower baseline levels of comprehension, acceptance,

Table 3 Study 2: binary multilevel probit regression analysis with emotion regulation strategies at t as independent variables and paranoid ideation at t + 1 as dependent variable

Variable	B	SE	95% CI	p
Modification	0.12	0.05	[0.03, 0.20]	0.012
Acceptance/tolerance	−0.03	0.05	[−0.12, 0.07]	0.588
Self-support	0.03	0.04	[−0.04, 0.11]	0.387
Comprehension	−0.08	0.04	[−0.16, −0.01]	0.036
Modification × self-support	−0.08	0.06	[−0.18, 0.04]	0.187
Modification × comprehension	−0.05	0.06	[−0.17, 0.07]	0.433
Acceptance/tolerance × self-support	0.00	0.05	[−0.09, 0.10]	0.946
Acceptance/tolerance × comprehension	−0.12	0.06	[−0.23, −0.01]	0.037
Negative emotions	0.08	0.04	[0.01, 0.16]	0.033
Paranoid ideation	0.16	0.09	[−0.00, 0.33]	0.056

Only cases were included with negative emotions > 0 at t. Negative emotions and paranoid ideation at t were included as control variables

CI confidence interval

and tolerance to be more likely to respond to a stressor with an increase of paranoid ideation (Lincoln et al. 2015). Extending this finding, both of our studies showed that high acceptance without an adequate understanding of emotions was associated with increased paranoid ideation. This suggests that acceptance is only adaptive when it is applied in combination with an adequate understanding of the respective emotion.

Acceptance/Tolerance as a Predictor of Paranoid Ideation and the Moderating Effect of Self-support

In study 1, we found self-support to moderate the association between acceptance/tolerance and paranoid ideation. Specifically, paranoid ideation was low when self-support was high and acceptance/tolerance was low. *In study 2*, self-support did not moderate the association between acceptance/tolerance and paranoid ideation. Thus, the present results do not corroborate the theoretical assumptions from the ACE model concerning self-support (Berking and Whitley 2014). However, findings from study 1 are in line with an experimental study by Diedrich et al. (2014) demonstrating that in direct comparison, acceptance and self-support were equally effective at down-regulating emotions. Our findings complement this study by indicating that self-support might be adaptive when applied as an alternative regulatory strategy by those individuals who do not accept their emotions. This inference from study 1 might further help to explain our unexpected finding that paranoid ideation was relatively low when acceptance/tolerance and comprehension were low. Specifically, we might speculate that self-support compensated for a lack of acceptance and thereby lowered levels of paranoid ideation. In sum, contrary to what we expected, rather than strengthening the negative association between acceptance and tolerance with paranoid ideation, self-support seemed to serve as an alternative strategy associated with decreased paranoid ideation for those participants who did not accept their emotions. However, this finding was not confirmed longitudinally and therefore needs to be reexamined in future research.

General Discussion

Interestingly, our findings were different for modification and acceptance. We found a direct negative effect of modification on paranoid ideation, irrespective of how well an emotion was understood. For acceptance we found that it only negatively influenced paranoid ideation provided that an emotion was well understood. A closer examination of the constructs of modification and acceptance could help to explain these diverging findings. Modification describes the ability to adaptively change emotions (Berking and Whitley 2014). In this broad definition, modification includes a range

of strategies that address factors associated with an emotion, such as an underlying problem (cf. problem-solving). Detailed information about an emotion might not be necessary for some of these strategies (e.g. problem-solving) to work. In contrast, acceptance refers to a willingness to stay in contact with the emotion itself (Campbell-Sills et al. 2006). Thus, it seems plausible that acceptance might be crucially facilitated when an emotion is well-defined and understood in contrast to a situation, in which the emotional state is diffuse. Possibly, the attempt to accept a diffuse emotional state results in a form of passive resignation (cf. Garnefski and Kraaij 2006). This could also help to explain our finding that acceptance in combination with an insufficient understanding leads to high levels of paranoid ideation.

Limitations

The present findings should be interpreted in the light of some limitations. First, in both studies, self-support was measured with only one item. Nevertheless, a validation study showed that the applied self-support assessment with the ERSQ-ES had good psychometric properties (Ebert et al. 2013), which was also confirmed by acceptable to good internal consistencies found in study 1 and study 2. Second, in study 2, we had to dichotomize paranoid ideation due to non-normality of the distribution and thereby relevant information may have been lost (Schlier et al. 2016). Third, PD and AR in study 1 included high percentages of female participants as compared to most at risk and psychosis samples (for a review, see Ochoa et al. 2012). This might limit the generalizability of our findings because gender differences have been found for emotion regulation (Nolen-Hoeksema 2012), which might affect the associations between regulatory strategies and paranoid ideation we examined here. Indeed, a reanalysis controlling for gender indicated that the direct association between modification and paranoid ideation could be specific to females, whereas adaptive patterns of acceptance and self-support or comprehension seem to hold, irrespective of gender. Finally, severe difficulties in awareness and clarity, which have been found in samples of patients with psychosis and those at risk of developing psychosis (Kimhy et al. 2012; Van Rijn et al. 2011), might have biased self-reports of discrete negative emotions in study 2. Future studies could account for this by using an alternative classification of emotion, such as valence and arousal (Wilhelm and Schoebi 2007).

Implications for Future Research and Clinical Practice

Despite these limitations our findings corroborate the theoretical assumption that it is important to consider the interplay of adaptive emotion regulation strategies in order to

understand better what is driving psychopathology (Aldao and Nolen-Hoeksema 2013; Berking and Whitley 2014; Ford et al. 2019). Specifically, our results suggest that accepting emotions can prevent subsequent paranoid ideation but only if emotions have been well comprehended. Our findings also suggest that self-support could be protective against paranoid ideation for those individuals who do not accept their emotions. Future research needs to clarify whether these adaptive patterns of emotion regulation are transdiagnositic or specific to paranoid ideation. Furthermore, it needs to be examined whether other adaptive emotion regulation patterns that are related to other psychopathology, such as PTSD or depressive sypmtoms (Boden et al. 2012; Diedrich et al. 2016), are also associated with paranoid ideation. It must be noted that this study along with the previous research investigates only one-directionally how emotion regulation strategies predict paranoid ideation. It is plausible however, that strategies emerge as a reaction to a present symptom and the accompanying negative emotion in an effort to reduce it. This could be an interesting question for future studies. Comprehension as a moderator is of special importance, given previous findings that people with a psychotic disorder and those at risk have lower levels of comprehension than healthy controls (Kimhy et al. 2012, 2016; Van Rijn et al. 2011). Our findings also have to be interpreted in the light of the theoretical assumption that negative emotion merely represents one of many factors that are assumed to precede paranoid ideation in cognitive models (Garety et al. 2001). Hence, it is not surprising that the associations we found were rather small. However, applying adaptive regulation patterns nevertheless accounted for clinically meaningful change in frequency of paranoid ideation and can further be well addressed in clinical interventions. Specifically, it could be promising to convey skills to become aware of, label and understand emotions to enable an adaptive and focused acceptance and tolerance. Finally, our findings suggest that individuals experiencing paranoid ideation could benefit from interventions that focus on effective combinations of regulation strategies, such as the Affect Regulation Training (Berking and Whitley 2014).

Compliance with Ethical Standards

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Appendix Studie III

Table A1

Study 1: Multiple Regression Analysis for Emotion Regulation Strategies as Independent Variables and Paranoid Ideation as Dependent Variable Controlling for Gender

Variable	*B*	*SE*	95% CI [a]	*p*
Modification	-1.01	1.35	[-3.36, 1.99]	.466
Acceptance/Tolerance	2.41	1.01	[0.18, 4.14]	.018
Self-Support	-0.13	0.14	[-0.44, 0.11]	.353
Comprehension	-0.04	0.21	[-4.26, 0.38]	.868
Modification × Self-Support	-0.08	0.23	[-0.46, 0.43]	.714
Modification × Comprehension	0.21	0.40	[-0.69, 0.89]	.615
Acceptance/Tolerance × Self-Support	0.49	0.20	[0.08, 0.83]	.013
Acceptance/Tolerance × Comprehension	-0.73	0.31	[-1.25, -0.06]	.014
Gender	-.275	.178	[-0.65, -0.06]	.140

Note. CI = confidence interval.

[a] Confidence interval per bootstrap with 1.000 samples.

Table A2

Study 1: Multiple Regression Analysis for Emotion Regulation Strategies as Independent

Variables and Paranoid Ideation as Dependent Variable with Complete Cases

Variable	B	SE	95% CI[a]	p
Modification	-0.32	0.16	[-0.66, -0.03]	.042
Acceptance/Tolerance	0.08	0.16	[-0.26, 0.41]	.640
Self-Support	-0.19	0.14	[-0.49, 0.07]	.189
Comprehension	-0.05	0.12	[-0.26, 0.20]	.646
Modification × Self-Support	-0.07	0.23	[-0.48, 0.42]	.746
Modification × Comprehension	0.13	0.25	[-0.43, 0.57]	.604
Acceptance/Tolerance × Self-Support	0.50	0.20	[0.04, 0.88]	.016
Acceptance/Tolerance × Comprehension	-0.47	0.19	[-0.79, -0.05]	.013

Note. CI = confidence interval.

[a] Confidence interval per bootstrap with 1.000 samples.

Table A3

Study 2: Binary Multilevel Probit Regression Analysis with Emotion Regulation Strategies at

t as Independent Variables and Paranoid Ideation *at t+1 as Dependent Variable Excluding*

Participants with < 70% Data Available

Variable	B	SE	95% CI	p
Modification	0.12	0.05	[0.03, 0.21]	.010
Acceptance/Tolerance	-0.02	0.05	[-0.11, 0.07]	.624
Self-Support	0.03	0.04	[-0.04, 0.11]	.407
Comprehension	-0.08	0.04	[-0.15, -0.01]	.050
Modification × Self-Support	-0.07	0.06	[-0.18, 0.04]	.191
Modification × Comprehension	-0.05	0.06	[-0.17, 0.07]	.411
Acceptance/Tolerance × Self-Support	0.03	0.05	[-0.09, 0.10]	.958
Acceptance/Tolerance × Comprehension	-0.11	0.06	[-0.22, -0.02]	.045
Negative Emotions	0.09	0.04	[0.01, 0.16]	.026
Paranoid Ideation	0.17	0.09	[-0.02, 0.34]	.047

Note. CI = confidence interval. Only cases were included with negative emotions > 0 at t.

Negative emotions and paranoid ideation at t were included as control variables.

Title: Efficacy of a transdiagnostic emotion regulation training in an at-risk sample: A randomized-controlled trial of group-based training versus self-help bibliotherapy

Short title: *Emotion regulation training at-risk sample*

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Abstract:

Objectives. Subclinical psychotic, depression, and anxiety symptoms form a transdiagnostic 'at-risk state' for the development of mental disorders. Emotion regulation has been identified as a transdiagnostic factor relevant to the formation of these symptoms. Here, we tested whether a group-based emotion regulation training would be more effective than an unguided self-help bibliotherapy on emotion regulation in reducing distress and at preventing transition to mental disorders in an at-risk sample. **Methods**. Participants with distressing subclinical psychotic, depression, or anxiety symptoms (n=138) were randomly allocated to either the eight-week group-based Affect Regulation Training (ART; Berking & Whitley, 2014) or an eight-week self-help bibliotherapy (BT). They underwent two-weekly measurements during the intervention, as well as at a six- and twelve-month follow-up. We tested whether the ART would be superior to BT in preventing the transition to any mental disorder at twelve-month follow-up. We also tested for differences in trajectories of psychopathology and emotion regulation (via questionnaires) and emotion regulation in daily life (via the experience-sampling method). **Results**. Participants in the ART condition showed a greater improvement of emotion regulation in daily life than those with BT, but the ART was not superior over BT in preventing the transition to mental disorders. There were significant longitudinal reductions from pre- to post-intervention for general psychopathology and symptoms but no superiority of the ART over BT. **Conclusions**. The results do not justify a recommendation of the ART over a self-help approach. Future studies should test flexible approaches to prevent disorders in at-risk groups with diverse needs.

Keywords:

Efficacy of a transdiagnostic emotion regulation training in an at-risk sample: A randomized-controlled trial of group-based training versus self-help bibliotherapy

There is compelling evidence that symptoms of psychosis, depression, and anxiety lie on a continuum from low frequency and minor distress beneath diagnostic threshold to high frequency and severe distress in mental disorders (Lewinsohn et al., 2000; Van Os et al., 2009). Symptoms below diagnostic threshold have been found to be common with an estimated lifetime prevalence of 6% for psychosis symptoms (McGrath et al., 2015), 17% for depression symptoms (Regeer et al., 2006), and a three-year prevalence of 11% for anxiety symptoms (Bosman et al., 2019). Furthermore, these subthreshold symptoms have been shown to co-occur, influence each other (Stochl et al., 2015; van Os, 2013), and to be associated with a heightened risk to transition into various mental disorders (Hartmann et al., 2019). Subthreshold depression symptoms, for example, have been associated with a heightened risk for depression and psychotic disorders (adjusted prevalence ratios: 3.71 for depression and 1.74 for psychotic disorders). Beyond that, the likelihood to develop a mental disorder increases substantially if people experience additional subthreshold symptoms (Scott et al., 2021). This has led researchers to suggest that subclinical psychotic, depression, and anxiety symptoms form a transdiagnostic at-risk state (e.g., McGorry et al., 2018). Research also indicates that a range of common, transdiagnostic factors underlie the formation of this at-risk state (Lynch et al., 2021). Consequently, there is a compelling argument to develop broad and comprehensive early interventions that address these transdiagnostic factors and potentially prevent mental disorders (Guloksuz & van Os, 2018).

One transdiagnostic factor that has been studied extensively over the last decades is emotion regulation (cf. Cludius et al., 2020), which has been defined to comprise (1) identifying the need to regulate, (2) selecting a regulation strategy, and (3) implementing the selected strategy (Gross, 2015). Numerous studies point towards emotion dysregulation in

individuals with mental disorders (Lincoln et al., 2022). For example, individuals with psychoses have been found to use rumination, self-blaming, and suppression more frequently and cognitive reappraisal less frequently than healthy controls (Ludwig et al., 2019). Similarly, major depression has been found to be associated with more rumination, avoidance, and suppression and less cognitive reappraisal, acceptance, and problem-solving (Visted et al., 2018). Finally, individuals with anxiety disorders have been reported to have less clarity about their emotions and to use less acceptance but more expressive suppression than healthy controls (Cisler & Olatunji, 2012; Dryman & Heimberg, 2018). Similar patterns of emotion dysregulation have been associated with subclinical psychotic (Chapman et al., 2019; Osborne et al., 2017), depression, and anxiety symptoms (Schäfer et al., 2017). Thus, there is sound evidence that emotion regulation represents a transdiagnostic factor associated with psychosis, depression, and anxiety.

Meanwhile, several interventions for different target groups have been developed to address emotion regulation, of which many have been found to show significant effects both on emotion regulation and on a broad range of psychopathological symptoms (Lincoln et al., 2022). One of these is the Affect Regulation Training (ART; Berking & Whitley, 2014) that was designed as a transdiagnostic intervention that can be applied in subclinical populations (Berking & Lukas, 2015). The ART is delivered in a group-based format and aims to convey an adequate understanding of and a non-judgmental stance towards emotions, acceptance, self-compassion, and strategies to change emotions. As a complementary element to regular CBT, the ART was effective in improving emotion regulation and reducing depression in inpatients (Berking et al., 2013). As a stand-alone intervention, it was superior to a waitlist in reducing symptoms of depression, which was mediated via an improvement of emotion regulation skills (Berking et al., 2019). Finally, there is preliminary evidence that the ART improves emotion regulation skills in subclinical populations (Berking et al., 2010; Buruck et

al., 2016). However, so far it has not been tested, whether it reduces subclinical general psychopathology or symptoms of psychosis, depression, and anxiety or prevents transition to a mental disorder.

Therefore, in the present study, we tested the efficacy of the ART in an at-risk sample with distressing symptoms of psychosis, depression, or anxiety by comparing it with a control-condition in form of an unguided self-help bibliotherapy (BT) on emotion regulation. To date, health-care systems usually do not fund psychotherapy for individuals below diagnostic threshold. Individuals in at-risk states therefore mostly depend on self-help approaches, such as BT. Indeed, self-help BT represents a cost-effective, easily accessible intervention that has been shown to be effective in reducing symptoms of depression, anxiety, and psychosis (for a meta-analysis, see Den Boer et al., 2004; for a review, see Gualano et al., 2017; Hazell et al., 2018). Nevertheless, group-based approaches have been found to be more effective than unguided, self-help BT in individuals with depression (for a network meta-analysis, see Cuijpers et al., 2019). Thus, a BT on emotion regulation controls for a self-led engagement with emotion regulation and allows to test whether the additional effort associated with a group training on emotion regulation is also justified in prevention.

We hypothesized that the ART would be more effective than BT in reducing general psychopathology over the eight-week intervention period and at six- and twelve-months follow-up and in preventing the transition to mental disorders at twelve-month follow-up (primary outcomes). We also expected the ART to be superior to BT in reducing symptoms of psychosis, depression, and anxiety over the intervention period and at six- and twelve-months follow-up, and in improving emotion regulation skills in daily life (secondary outcomes).

Method

Design and procedure

We used a two-armed randomized active-controlled design comparing the eight-week, group-based ART to BT (see Figure 1). The study was carried out between February 2018 and March 2020 at Universität Hamburg, Germany. We recruited participants via online platforms, newsletters, leaflets and posters in public spaces in Hamburg. Participants were pre-screened for eligibility via an online-questionnaire, followed by face-to-face diagnostic assessments of in- and exclusion criteria and provision of informed consent. The study design is depicted in Figure 2. Before the intervention (T1), participants answered a baseline online questionnaire on psychopathology and additional demographic information and were assessed for level of functioning. This was followed by two-weekly online assessments during the intervention (T2–T4), an online post-intervention assessment (T5), and online follow-up assessments at six (FU6) and twelve months (FU12). T1 and T5 also involved a one-week experience-sampling assessment. The FU12 also included a diagnostic assessment, an assessment of level of functioning, life events, psychological and pharmacological support, and an evaluation of the intervention. All participants received a compensation of 40 €, participants with a minimum of 75% of T5 ESM questions received additional 10 €. The study was approved by the local ethics committee of the Universität Hamburg (2018_148). This study was not pre-registered.

Participants

The exclusion criteria contained: currently receiving psychological therapy or a diagnosis of a current Axis I or II disorder as diagnosed with the Structured Clinical Interview for DSM-IV (SCID; German version: Wittchen et al., 1997). Note that specific phobia was not an exclusion criterion due to its high prevalence and relatively minor distress (Comer et al., 2011). The inclusion criteria contained: sufficient German language skills, an age between 18 and 65 years and the presence of clinically relevant, subthreshold psychopathology. Subthreshold psychopathology was defined as deviation from the norm in symptom frequency and associated distress in the domain of either a) positive psychotic, or b) negative psychotic,

or c) depression symptoms as assessed with the Community Assessment of Psychic Experiences (CAPE; Stefanis et al., 2002), or d) anxiety, or phobic symptoms as measured with the Brief Symptom Inventory (BSI; Franke, 2000). There was no upper limit for symptom frequency and distress. The magnitude of deviation from the norm is defined in the measures section.

The estimation of the necessary sample size was based on a simulation study for continuous multilevel data by Maas and Hox (2005) who found a sample size of $n=100$ at level two to enable accurate estimation of level two variances for an expected medium effect size. Reckoning with a dropout rate of 20%, we aimed to randomize a minimum of $n=125$ participants. Participants were continuously sampled and were able to start when a study cohort was complete ($n=12$ in each condition).

Measures

Primary outcomes

General psychopathology was assessed with the Global Severity Index (GSI) of the BSI (German version: Franke, 2000). This questionnaire consists of 53 items, which are rated on a five-point Likert scale (0=not at all – 4=extremely) and refers to the past seven days. The GSI reflects overall psychopathological distress and is calculated as an average score across all 53 items. It showed excellent internal consistencies in validation studies (Franke, 2000). Cut-off scores on the anxiety and phobic subdomain of the BSI were calculated as one standard deviation above the mean in a healthy norm sample (anxiety symptoms≥0.68 or phobic symptoms≥0.39; Franke, 2000).

Diagnoses were assessed at FU12 as any current or remitted Axis I disorder that had occurred during the past 12 months with the SCID (German version: Wittchen et al., 1997) by trained research assistants who were blind to the allocated condition.

Secondary Outcomes

Psychotic symptoms were assessed with the CAPE (Stefanis et al., 2002). The scale consists of 42 items that participants rate on a 4-point Likert scale regarding their frequency (1=never – 4=[nearly] always) and distress (1=not distressed – 4=very distressed). It contains the subscales of positive, negative, and depression symptoms. As measurements (T1–T5) were two weeks apart, we adapted the reference period to two weeks. The CAPE has demonstrated good psychometric quality (Konings et al., 2006; German version: Schlier et al., 2015) and to be an appropriate instrument to detect psychosis risk (Mossaheb et al., 2012). Cut-off scores on the CAPE were calculated based on the highest quartile of a broad international community sample (Lincoln et al., 2017). As the reference period was adjusted from four to two weeks, original weighted values for the highest quartile were reduced by 0.1 and transformed back to sum scores: frequency≥31 and distress≥24 for positive psychotic symptoms, frequency≥31 and distress≥26 for negative psychotic symptoms, or frequency≥17 and distress≥18 for depression symptoms.

Depression Symptoms were assessed with the Beck Depression Inventory-II (BDI-II; original version: Beck, Steer & Brown, 1996; German version: Kühner et al., 2007). Participants rate 21 items that refer to the past two weeks on a 4-point Likert scale (0=e.g., not feeling sad at all – 3=e.g., feeling unbearably sad). The German version of the BDI-II has good psychometric quality (Alexandrowicz et al., 2014; Kühner et al., 2007).

Anxiety symptoms were assessed with the short version of the State Trait Anxiety Inventory (STAI; original version: Spielberger et al., 1971; German version: Laux et al., 1981). The STAI consists of two subscales measuring state anxiety (STAI-S) and trait anxiety (STAI-T). Both scales provide good psychometric quality (Laux et al., 1981).

Adaptive emotion regulation was assessed with the Emotion Regulation Skills Questionnaire-27 (ERSQ-27; Berking & Znoj, 2008). Participants indicated the frequency of emotion regulation skills used over the past week on a Likert scale (0=not at all – 4=[almost] always). We calculated a total score as an average across all 27 items that is indicative of a

general emotion regulation ability and has good psychometric quality (Berking & Znoj, 2008).

Furthermore, we used the Emotion Regulation Skills Questionnaire-Emotion Specific version (ERSQ-ES; Ebert et al., 2013), which assesses regulation strategies applied in response to several emotions. Here, we adapted the ERSQ-ES for the experience-sampling method (ESM). The ESM represents an ecologically valid and fine-grained approach to assess processes in daily life and has been identified as a particularly change-sensitive approach to evaluate treatments effects (Myin-Germeys et al., 2018). It was administered via movisensXS Version 1.5.0 (movisens GmbH, Karlsruhe, Germany) on participants' private or university-owned smartphones. Participants were provided with a detailed explanation and examples of items along with an instruction sheet. Over a period of six consecutive days, five times per day between 9 am and 10 pm, participants were notified with signal contingent, semirandom time sampling (Wheeler & Reis, 1991) with minimum time gaps of 1.5 hours in between notifications. At each notification, participants were first asked to rate the intensity of each of a pre-defined list of negative emotions experienced just before the notification, then to select the emotion with the highest intensity and to indicate the use of regulatory strategies on a five-point Likert scale (0="does not apply at all" – 4="fully applies") specific to the selected emotion. We used the average score across all emotion regulation strategies, over all emotions, which has shown good psychometric properties (Ebert et al., 2013).

Additional Outcomes

We included an extended assessment, including measures on well-being, general emotion regulation skills and specific regulation strategies, level of functioning, and ESM data on emotions and symptoms (i.e., paranoid ideation; see Appendix). They are not depicted in the main document given their limited additional value in the context of this study. Time spent daily with training materials was assessed at T2–T5 via the item: "How long have you

trained your emotion regulation skills on the basis of the material provided?". Response options were: 1 ("I didn't do any exercises"), 2 ("less than 5 minutes per day"), 3 (less than 10 minutes per day"), 4 ("less than 15 minutes per day"), 5 ("more than 15 minutes per day"). At FU12, participants evaluated both interventions (ART, BT) in an open question format. The baseline ESM data has also been used in a publication on associations between adaptive emotion regulation and paranoid ideation (Wittkamp et al., 2021).

Affect Regulation Training

The ART is a manualized, group-based training that begins with psychoeducation on emotions, emotion generation, the function of emotions, and their neuroscientific and psychophysiological background, which is followed by six modules on different emotion regulation skills: 1) muscle and breathing relaxation, 2) mindfulness awareness and labelling of emotions, 3) acceptance of emotions, 4) compassionate self-support, 5) analysing emotions, and 6) modifying emotions. We administered the ART in groups of six to ten participants over eight weeks with weekly sessions of 150 minutes in close accordance with the ART manual (Berking & Whitley, 2014). Participants who missed a session were given the opportunity to catch up via phone or face-to-face meetings with the trainer who administered the group sessions. Participants were additionally motivated to practice at home using practice materials, such as audio-files and pocket calendars including short exercises. The trainer (__) was educated and supervised in the ART by its developer, Matthias Berking, and accompanied by a research assistant. All sessions were videotaped for supervision.

Self-help bibliotherapy

Participants in the active control condition (BT) were provided the self-help book "Gefühle im Griff" (feelings under control) by Barnow (2018). The book contains a psychoeducational section on emotions and emotion regulation. In a practical section, an eight-week training program is provided that covers one emotion regulation strategy per week. Strategies covered include cognitive reappraisal, acceptance, and problem-solving

(which are recommended as adaptive strategies) on the one hand, and rumination, suppression and avoidance (categorized as maladaptive) on the other. Each chapter contains self-tests, worksheets and various exercises, such as breathing relaxation, mindfulness, awareness, and physical exercises. Readers are encouraged to practice 20 minutes daily. Participants were instructed to start the program on a specific date that corresponded to the first group session of the ART condition in the respective cohort and received no additional support from the research team.

Randomization

Participants were randomly allocated to the ART or BT via a computer-generated list (www.sealedenvelope.com) that was based on a permuted block design with block lengths of four to ensure an even distribution to both conditions (ART, BT). Research staff was blind to the allocation sequence before assignment.

Statistical analyses

Statistical analyses were conducted with IBM SPSS Statistics (version 28). To test for differences between the ART and BT in the development of mental disorders at FU12, we calculated chi square tests with the dependent variable diagnoses at FU12 and condition as a predictor. To test the effect on our primary and secondary outcomes, we calculated multilevel growth curve models with measurements at level 1 nested within participants at level 2. The time variable was coded as weeks since baseline. Time was included as a predictor at level 1. Condition was included as level 2 predictor and moderator to test for the superior efficacy of the ART. All models were tested including random intercepts and slopes (cf. Barr et al., 2013), as well as a diagonal and heterogeneous autoregressive covariance structure. When models did not converge, we first alternated covariance structures and in a last step removed random slopes. In addition, we used models with the best fit after comparing restricted maximum likelihood (REML) against maximum likelihood (ML) parameter estimation.

Intention-to-treat analyses were compared with complete case analyses. There was no missing data on independent variables (condition, time). For multilevel models with only missing data in the dependent variable, the maximum likelihood solution and the restricted maximum likelihood solution have been recommended as they do not assume an equal number of measurements and estimate most likely values of parameters based on the observed data (van Buuren, 2018). To test for differences between the ART and BT regarding changes in emotion regulation in the ESM, we used multilevel models to account for the hierarchical structure of the data with measurements at level 1 nested within participants at level 2 including random intercepts. Time was included as a level 1 predictor and condition as a level 2 predictor and moderator.

Results

Descriptive statistics

The flow of participants is depicted in Figure 1. As can be seen, n=138 were allocated to the study conditions (ART, BT). Descriptive statistics for primary and secondary outcomes at measurement points are depicted in Table 2. Those participants in the ART who started the intervention attended on average 5.53 of 8 possible sessions (SD=2.12). At T2, participants in the ART had spent more daily time with the material than those with BT (Mdn_{ART}=4, less than 15 minutes per day; Mdn_{BT}=3), exact Mann-Whitley-U-Test: U=882.50, p<.001. Participants in the ART and BT did not differ in the daily time they had spent with training materials at T3–T5 (Mdn=3, less than 10 minutes per day).

Preliminary analyses

There were no baseline differences between the ART and BT regarding demographics (see Table 1). We tested for possible confounding variables and found that the study cohort significantly moderated the association between time and STAI-T. Consequently, we included study cohort as a moderator in the main model for STAI-T. The average compliance rate in the experience-sampling assessment was 80% at T1 and 75% at T5, which corresponds to

compliance rates found in other ESM studies (Vachon et al., 2019). A post-hoc categorization of the qualitative training evaluations revealed that all surveyed participants in the ART were satisfied or very satisfied with the conception of the training and with the ART group instruction. The majority (23 participants) were satisfied with the group atmosphere, 4 reported that the atmosphere improved over time and 8 indicated both positive and negative aspects of the group atmosphere. In the BT, 23 participants were very satisfied/satisfied with the conception of the BT (9 neutral, 2 dissatisfied).

Differences in rates of transition to mental disorders at FU12

As can be seen in Table 2, 19% in the ART as compared to 24% of participants in BT at FU12 fulfilled the diagnostic criteria for a current or a remitted disorder that had its onset during the past 12 months (primary outcome; n=12 major depressive episode, n=1 dysthymic disorder, n=3 posttraumatic stress disorder, n=1 generalized anxiety disorder, n=1 delusional disorder). There were no significant differences between the ART and BT: X^2 (2, 73)=.254, p=.614, φ=.06.

Differences in changes of general psychopathology

As can be seen in Table 3, there was no significant interaction effect between condition×time (T1–T5) on BSI (primary outcome). There was a significant effect of time (T1–T5) on BSI of medium size. However, time was no longer a significant predictor after including the measurements at FU6 and FU12 (see Table 4).

Differences in changes of psychotic, depression, and anxiety symptoms

There was no significant interaction effect between condition×time (T1–T5) on CAPE, BDI-II and STAI-S, STAI-T (secondary outcomes; see Table 3), but again, there were significant effects of time with large effects on CAPE positive symptom frequency and distress, negative symptom frequency and distress; medium effects on STAI-T; and small effects on BDI-II and STAI-S. The effects of time remained significant at FU6 and FU12 on BDI-II, STAI-S, and STAI-T (see Table 4).

Differences in changes of emotion regulation

As can be seen in Table 3, there was a significant, medium interaction effect of condition×time showing higher improvements on ERSQ-ES total score as assessed with the ESM in the ART than in BT. There was no significant interaction effect of condition×time for ERSQ-27 as assessed with a retrospective questionnaire at (T1–T5), but this effect was significant in favour of BT including follow-ups FU6 and FU12 (Table 4). Furthermore, there was a significant, medium effect of time (T1–T5) and this effect was still significant until follow-ups (T1–FU12).

Sensitivity analysis

The results of the complete case analysis confirm our main findings (see Appendix). Specifically, the results show effects of time for all primary and secondary outcomes and no interaction effects of time×group for our primary and secondary outcomes except for ERSQ-ES as assessed with the ESM. A post-hoc power analysis with G*Power (Faul et al., 2009), 1-ß =.80 revealed that the chi-square test for our primary outcome of diagnoses with an estimated small effect size (φ=.10) had insufficient power (.01) to detect a clinically significant difference between the ART and BT. A total sample size of n=964 would have been necessary to detect a small effect (i.e. a transition rate of 17% in the ART versus 24% in BT).

<div align="center">

Discussion

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We aimed to determine whether a group-based emotion regulation intervention would be superior to unguided BT in preventing the transition to mental disorders in a subclinical sample with distressing symptoms of psychosis, depression, or anxiety. The ART was superior to the BT in improving ESM-reported emotion regulation but was not superior in preventing transition to mental disorders at 12-months follow-up or in reducing general psychopathology and symptoms.

The efficacy of the ART for emotion regulation corroborates previous studies on the ART (Berking et al., 2010, 2019, 2022; Buruck et al., 2016). The ART did not show superiority over unguided BT, however, when emotion regulation was assessed via a retrospective questionnaire. This corroborates the marked discrepancy between retrospective (or trait) measures of emotion regulation and state emotion regulation as assessed with the experience-sampling assessments that has been reported in previous studies (e.g., Brockman et al., 2017; Ludwig et al., 2020). This discrepancy has been largely ascribed to a lack of validity of the retrospective questionnaires that are prone to recall bias and reporting biases due to present emotional states (Lincoln et al., 2022). Moreover, trait measures of emotion regulation have the disadvantage that they do not account for variations in strategy use across diverse contexts (Brockman et al., 2017). The ESM is seen as a major advancement on questionnaire assessments, as it has been shown to be more ecologically valid, less prone to recall bias, and – due to its change-sensitivity – a better indicator of intervention effects (Myin-Germeys et al., 2018). Therefore, we argue that it is justified to give more weight to the ESM findings and to conclude that our study corroborates previous findings that the ART in itself is effective in improving emotion regulation.

The ART could not prevent 19% of participants from transitioning to a mental disorder, which was comparable to 24% in BT. Among those who transitioned (n=16), most fulfilled the criteria for a major depressive episode (n=12). This corresponds to an incidence of 16%, which is higher than annual incidence rates for major depressive episodes in community samples (3%; for a review of epidemiological studies, see Ferrari et al., 2013) but lies in the range found in the intervention conditions of prevention trials for major depression (2%-21%; for a review, see Munoz et al., 2010). A post-hoc power analysis revealed that our test had insufficient power to detect a clinically significant difference between the ART and BT. However, considering the minimal difference between transitions to mental disorders

detected in our study it is unlikely that a bigger sample would have led to a clinically significant difference between conditions. Interestingly, despite the fact that around one in five participants transitioned to any mental disorder in our study, the average general psychopathology, symptoms of psychosis, depression, and anxiety markedly decreased over the course of both interventions. Previous studies that tested BT's with a focus on facets of emotion regulation also found effects on symptoms of depression and anxiety (Hazlett et al., 2016; Jeffcoat & Hayes, 2012). Due to a lack of a control group receiving no intervention, we cannot clarify if both the ART and BT had an effect beyond unspecific effects. In the light of previous findings and our results, it can still be speculated that both the ART and BT prevented an even higher transition rate.

The more elaborate, in-person ART was not superior over unguided BT in reducing psychopathology. One possible explanation could be that it needs stronger, possibly more comprehensive effects on emotion regulation than the medium effect on adaptive emotion regulation we found in the ESM. Comprehensive reviews indicate that psychopathology is more prominently associated with an overuse of "maladaptive" strategies (e.g., suppression, rumination, and avoidance) than with an underuse of "adaptive" strategies (e.g., cognitive reappraisal, problem-solving, and acceptance; see Lincoln et al., 2022 – also for a discussion of the adaptive vs. maladaptive distinction). The ART has its main focus on conveying adaptive strategies (Berking & Whitley, 2014), whereas the BT used here also explicitly addresses maladaptive strategies (Barnow, 2018). Thus, it is conceivable that additional facets of emotion regulation need to be addressed, complementary to those addressed in the ART, to significantly reduce psychopathology and symptoms. Another disadvantage of the ART as compared to BT could have been its inflexibility and uncontrollability regarding pace of exposure, content focus, and session scheduling (cf. McKenna et al., 2010). In our study, attending ART group-sessions of 2.5 hours was challenging for participants with high average

working hours (around 30 hours/week). Eight participants explained that scheduling problems prevented them from starting the ART and the average attendance of M=5.5 (SD=2.1) group sessions shows that some participants were unable to achieve a desirable session attendance. In contrast, participants in the BT condition could decide when to train and could focus on their prioritized aspects of emotion regulation. All participants in the ART were satisfied with the training conception as well as group instruction and a majority of n=23 reported a pleasant group atmosphere. Nevertheless, eight participants also reported some negative aspects of the group atmosphere, some of which resulted from discomfort sharing personal experiences with strangers. Thus, for some participants the BT may have been more suitable.

Based on our findings, we therefore suggest that future research on prevention in an at-risk population could investigate an emotion regulation training with a stronger focus on identifying and preventing the overuse of suppression, rumination, and avoidance (cf. Barlow et al., 2011; Bullis et al., 2018; Linehan, 1993; Renna et al., 2017). Moreover, Arango et al. (2018) have recommended that while people in an at-risk state should be supported in strengthening certain skills (cf. emotion regulation) it is also relevant to target contextual risk factors, such as unhealthy nutrition, lack of exercise, bullying, and a stressful work environment. Furthermore, future research could examine whether participants would benefit from a more flexible, blended approach, including extended opportunities to review session content and to train regularly while underway, for example with the support of an application on their mobile phone (cf. Böhme & Berking, 2021). Research also indicates the relevance of shared decision-making and active choices for intervention formats with respect to clinical outcomes (Lindhiem et al., 2014). In clinical practice, participant preferences should therefore be taken into account in deciding whether to select a group-based intervention or a self-help BT.

Our findings should be considered in the light of some strengths and limitations. Strengths were that sessions closely followed the ART manual, which provides clear and detailed instructions for trainers. The trainer received a structured course on the ART and was supervised by its developer. Self-help BT as an active control condition allowed to control for the stand-alone effect of a structured, autonomous engagement with emotion regulation content for an equal period of eight weeks. This enabled us to evaluate the additional value of the ART as a more elaborate, group-based intervention. However, our design did not include a control group that enabled to draw strong conclusions in regard to emotion regulation as a mechanism of change. Furthermore, we did not include a control group receiving no intervention and thus had no control for unspecific effects, such as regression to the mean and spontaneous remission. Furthermore, our sample was 75% female. This might limit the generalizability of our findings as gender differences have been found for emotion regulation (Nolen-Hoeksema, 2012). Moreover, the sample was highly educated which might have led to a higher benefit from the BT than might be expected in a more representative sample. Finally, 16% of participants in the ART and 11% in the BT condition dropped out between T1–T5 and an additional 9% in the ART and 22% in BT dropped out until FU12. We addressed the problem of missing data by using multilevel analyses and by comparing intention-to-treat with complete case analyses.

We conclude that the ART was efficacious in improving emotion regulation in an at-risk sample, feasible, and sufficiently accepted. However, it was not superior to a self-help manual in respect to the prevention of mental disorders or the reduction of psychopathology. Future research should test whether emotion regulation represents a relevant mechanism of change in the context of prevention. Furthermore, future studies could consider an extended and more flexible approach to reach a broad spectrum of at-risk participants, enhance compliance, and produce a stronger effect on psychopathology.

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Table 1

Baseline Demographics and Clinical Characteristics

	Total (*n*=138)	ART (*n*=68)	BT (*n*=70)		
	M (*SD*)/ *n* (%)	*M* (*SD*)/ *n* (%)	*M* (*SD*)/*n* (%)	F/χ^2	*p*
Age (years)	36.44 (12.08)	35.58 (11.55)	37.25 (12.59)	0.559	.456
Gender (female)	89 (75.4%)	42 (73.7%)	47 (77%)	0.180	.671
Highest education:				4.591	.468
Middle school	1 (0.08%)	0 (0%)	1 (1.6%)		
Secondary school	4 (3.4%)	3 (5.3%)	1 (1.6%)		
Upper second school	24 (20.3%)	12 (21.1%)	12 (19.7%)		
Apprenticeship	22 (18.6%)	9 (15.8%)	13 (21.3%)		
Bachelor's degree	26 (22.0%)	10 (17.5%)	16 (26.2%)		
Master's degree	41 (34.7%)	23 (40.4%)	18 (29.5%)		
Weekly working hours	30.66 (14.17)	32.93 (14.10)	28.65 (14.07)	2.296	.133
Income in Euro:				8.246	.221
Low (<1,750)	58 (49.2%)	27 (47.4%)	31 (50.8%)		
Middle (1,750 - 4,000)	45 (38.1%)	25 (43.9%)	20 (32.8%)		
High (< 4,000)	15 (12.7%)	5 (8.8%)	10 (16.4%)		
Diagnosis lifetime	30 (25.4%)	15 (26.3%)	15 (24.6%)	0.046	.830
Parents diagnosis lifetime	25 (21.2%)	16 (28.1%)	9 (14.8%)	3.129	.077
Marital status:					
Single/divorced/ widowed	56 (47.5%)	26 (45.6%)	30 (49.2%)	1.333	.514
Married	20 (16.9%)	8 (14.0%)	12 (19.7%)		
In a relationship	42 (35.6%)	23 (40.4%)	19 (31.1%)		
Nationality (German)	97 (82.9%)	47 (83.9%)	50 (82.0%)	15.908	.388

Note. ART=Affect Regulation Training condition, BT=self-help bibliotherapy control condition

Anhang D Studie IV

Table 2
Descriptive Statistics for Outcomes at All Measurement Points

Outcomes	Condition	T1 M (SD)/n	n	T2 M (SD)	n	T3 M (SD)	n	T4 M (SD)	n	T5 M (SD)	n	FU6 M (SD)	n	FU12 M (SD)/n	n
Primary Outcomes															
Current diagnosis	ART	n = 0	36	n.a.		n.a.		n.a.		n.a.		n.a.		n = 5	5
	BT	n = 0	37	n.a.		n.a.		n.a.		n.a.		n.a.		n = 6	6
Diagnosis past 12 months	ART	n.a.	36	n.a.		n.a.		n.a.		n.a.		n.a.		n = 2	2
	BT	n.a.	37	n.a.		n.a.		n.a.		n.a.		n.a.		n = 3	3
BSI	ART	0.66 (0.45)	55	0.63 (0.50)	47	0.55 (0.40)	45	0.52 (0.39)	44	0.45 (0.37)	45	0.55 (0.50)	42	0.50 (0.55)	42
	BT	0.74 (0.40)	61	0.70 (0.46)	60	0.58 (0.40)	56	0.49 (0.35)	52	0.51 (0.40)	54	0.65 (0.61)	42	0.54 (0.41)	42
Secondary Outcomes															
CAPE Positive Freq	ART	28.32 (6.40)	57	23.23 (3.74)	47	22.91 (3.70)	45	22.55 (3.83)	44	22.24 (3.33)	45	23.45 (4.44)	42	23.19 (3.35)	43
	BT	28.34 (4.36)	61	23.87 (3.60)	60	23.43 (3.12)	56	23.10 (3.21)	52	23.05 (2.91)	55	24.42 (3.35)	43	23.86 (3.16)	42
CAPE Positive Dis	ART	27.11 (5.66)	57	22.55 (3.60)	47	21.89 (2.72)	45	21.73 (3.20)	44	21.51 (2.63)	45	22.05 (3.95)	42	21.81 (2.80)	43
	BT	26.79 (4.47)	61	23.22 (3.51)	60	22.36 (2.47)	56	22.12 (2.56)	52	22.07 (2.65)	55	23.23 (3.46)	43	22.33 (3.21)	42
CAPE Negative Freq	ART	30.39 (4.35)	57	26.13 (6.81)	47	24.71 (7.02)	45	24.30 (6.93)	44	22.80 (6.65)	45	24.71 (6.82)	42	23.49 (7.36)	43
	BT	31.46 (6.86)	61	27.45 (7.39)	60	25.18 (7.33)	56	24.81 (7.68)	52	24.96 (7.97)	55	26.60 (8.36)	43	24.95 (7.24)	42
CAPE Negative Dis	ART	32.25 (5.80)	57	25.66 (8.36)	47	24.64 (8.35)	45	23.68 (8.21)	44	22.16 (8.18)	45	22.67 (8.07)	42	21.37 (6.71)	43
	BT	32.44 (7.42)	61	28.43 (8.88)	60	25.27 (8.48)	56	23.96 (8.04)	52	24.20 (8.74)	55	25.64 (9.28)	43	24.40 (8.52)	42
BDI-II	ART	12.25 (8.15)	55	n.a.		n.a.		n.a.		8.56 (7.12)	45	9.88 (8.35)	45	9.19 (9.28)	42
	BT	13.79 (7.95)	61	n.a.		n.a.		n.a.		9.65 (8.02)		12.07 (12.09)		8.55 (8.70)	42
STAI-S	ART	45.73 (9.43)	55	n.a.		n.a.		n.a.		40.96 (9.03)	45	41.33 (10.22)	45	41.56 (12.14)	43
	BT	47.03 (9.80)	61	n.a.		n.a.		n.a.		41.04 (8.57)		42.40 (10.78)		40.93 (9.56)	42
STAI-T	ART	47.90 (10.40)	55	n.a.		n.a.		n.a.		42.00 (11.27)	45	41.29 (11.56)	45	40.88 (12.84)	43
	BT	49.72 (9.50)	61	n.a.		n.a.		n.a.		44.24 (10.39)		45.21 (13.54)		43.81 (9.71)	42
ERSQ-27	ART	2.49 (0.65)	56	2.62 (0.60)	47	2.87 (0.49)	45	2.89 (0.49)	44	2.98 (0.55)	45	2.94 (0.64)	42	2.95 (0.65)	43
	BT	2.50 (0.61)	61	2.59 (0.55)	60	2.70 (0.59)	56	2.87 (0.54)	52	2.92 (0.61)	55	2.87 (0.65)	45	3.03 (0.56)	42
ERSQ-ES ESM	ART	2.05 (1.00)	69	n.a.		n.a.		n.a.		n.a.		n.a.		3.02 (0.79)	42
	BT	2.16 (0.99)	66	n.a.		n.a.		n.a.		n.a.		n.a.		2.56 (1.09)	45

Note. T=measurement, FU6/FU12=follow-ups at 6/12 months, n.a.=not assessed, ART=Affect Regulation Training condition, BT=self-help bibliotherapy control condition, BSI=Brief Symptom Inventory, CAPE=Community Assessment of Psychic Experiences, Freq=Frequency, Dis=Distress, BDI=Beck Depression Inventory, STAI-S/STAI-T=State Trait Anxiety Inventory-State/Trait, ERSQ=Emotion Regulation Skills Questionnaire, ERSQ-ES=Emotion Regulation Skills Questionnaire-Emotion Specific, ESM=Experience-Sampling Method.

Table 3

Multilevel Growth Curve Models With Independent Variables Condition and Time and Clinical Outcome Variables

Outcomes	Predictors	*B*	*SE*	95% CI	*t*	*p*	R^2 w/b[1]
T1/2/3/4/5							
Primary Outcome							
BSI	Time	-0.030	0.005	[-0.040, -0.020]	-5.858	**<.001**	.32/.00
	Condition(ART)	-0.070	0.073	[-0.215, 0.737]	-0.965	.336	
	Time×Condition	0.005	0.008	[-0.010, 0.020]	0.654	.515	.32/.00
Secondary Outcomes							
CAPE Positive Frequency[2]	Time	-0.183	0.039	[-0.259, 0.106]	-4.711	**<.001**	.33/.00
	Condition (ART)	-0.123	0.687	[-1.478, 1.231]	-0.179	.858	
	Time×Condition	-0.031	0.058	[-0.145, 0.083]	-0.532	.596	.33/.00
CAPE Positive Distress[2]	Time	-0.212	0.043	[-0.296, -0.128]	-4.975	**<.001**	.30/.00
	Condition (ART)	-0.310	0.607	[-1.506, 0.885]	-0.512	.609	
	Time×Condition	-0.009	0.063	[-0.134, 0.116]	-0.149	.882	.30/.00
CAPE Negative Freq[3]	Time	-0.524	0.104	[-0.732, -0.315]	-4.991	**<.001**	.40/.00
	Condition (ART)	-0.432	1.163	[-2.736, 1.872]	-0.372	.711	
	Time×Condition	-0.184	0.156	[-0.494, 0.126]	-1.180	.241	.40/.01
CAPE Negative Dis[3]	Time	-0.853	0.119	[-1.088, -0.617]	-7.177	**<.001**	.40/.01
	Condition (ART)	-0.544	1.280	[-3.082, 1.994]	-0.425	.672	
	Time×Condition	-0.090	0.177	[-0.442, 0.262]	-0.507	.613	.40/.02
ERSQ-27	Time	0.055	0.009	[0.036, 0.073]	5.928	**<.001**	.45/.00
	Condition (ART)	0.022	0.108	[-0.192, 0.235]	0.201	.841	
	Time×Condition	0.006	0.014	[-0.021, 0.033]	0.425	.672	.45/.00
T1/T5							
BDI-II[2,3]	Time	-0.472	0.113	[-0.696, -0.248]	-4.177	**<.001**	.43/.00
	Condition (ART)	-1.703	1.490	[-4.655, 1.249]	-1.143	.255	
	Time×Condition	0.072	0.168	[-0.261, 0.405]	0.430	.668	.43/.00
STAI-S[2,3]	Time	-0.720	0.159	[-1.036, -0.403]	-4.513	**<.001**	.19/.00
	Condition (ART)	-2.850	1.737	[-6.292, 0.591]	-1.655	.104	
	Time×Condition	0.283	0.236	[-0.185, 0.750]	1.198	.234	.19/.00
STAI-T[2]	Time	-0.995	0.217	[-1.426, -0.564]	-4.579	**<.001**	.25/.00
	Condition (ART)	-3.436	1.846	[-7.092, -0.219]	-1.862	.065	
	Time×Condition	0.122	0.186	[-0.248, 0.492]	0.655	.514	.25/.00
	Study Cohort	-1.584	0.561	[-2.695, -0.472]	-2.821	**.006**	
	Time×Study Cohort	0.115	0.555	[0.005, 0.225]	2.066	**.041**	
ERSQ-ES ESM	Time	0.437	0.090	[0.258, 0.615]	4.855	**<.001**	.23/.34
	Condition (ART)	-1.076	0.119	[-0.344, 0.129]	-0.901	.369	
	Time×Condition	0.390	0.131	[-0.129, 0.651]	2.971	**.004**	.23/.36

Note. BSI=Brief Symptom Inventory, CAPE=Community Assessment of Psychic Experiences, Freq=Frequency, Dis=Distress, BDI=Beck Depression Inventory, STAI-S/-T=State Trait Anxiety Inventory-State/Trait, ERSQ=Emotion Regulation Skills Questionnaire, ERSQ-ES=Emotion Regulation Skills Questionnaire-Emotion Specific, ESM=Experience-Sampling Method.

[1] R^2 as effect size measure calculated based on centered predictors and standardized outcome variables to indicate (w=within)- and (b=between)-participant variance explained.

[2] Multilevel models without random slopes

[3] Multilevel models with REML

Table 4

Multilevel Growth Curve Models With Independent Variables Condition and Time and Clinical Outcome Variables Including Follow-Ups

Outcomes	Predictors	*B*	*SE*	95% CI	*t*	*p*
T1/2/3/4/5/FU6/12						
Primary Outcome						
BSI	Time	-0.002	0.001	[-0.004, 0.000]	-1.967	.052
	Condition(ART)	-0.458	0.683	[-0.181, 0.089]	-0.671	.503
	Time×Condition	0.001	0.001	[-0.002, 0.004]	0.747	.457
Secondary Outcomes						
CAPE Positive Freq[1]	Time	0.009	0.006	[-0.002, 0.020]	1.560	.121
	Condition(ART)	-0.311	0.604	[-1.507, 0.885]	-0.515	.608
	Time×Condition	-0.003	0.008	[-0.020, 0.013]	-0.427	.670
CAPE Positive Dis[1]	Time	0.001	0.006	[-0.011, .0129]	0.112	.911
	Condition(ART)	-0.385	0.499	[-1.372, 0.603]	-0.771	.442
	Time×Condition	-0.005	0.009	[-0.022, 0.013]	-0.528	.599
CAPE Negative Freq	Time	-0.020	0.014	[-0.049, 0.008]	-1.420	.159
	Condition(ART)	-0.796	1.217	[-3.206, 1.613]	-0.654	.514
	Time×Condition	-0.009	0.020	[-0.049, 0.032]	-0.428	.669
CAPE Negative Dis	Time	-0.030	0.016	[-0.062, 0.002]	-1.891	.062
	Condition(ART)	-0.519	1.455	[-3.402, 2.363]	-0.357	.722
	Time×Condition	-0.036	0.023	[-0.081, 0.009]	-1.601	.113
ERSQ-27	Time	0.006	0.001	[0.004, 0.009]	4.897	**<.001**
	Condition(ART)	0.070	0.093	[-0.115, 0.254]	0.748	.456
	Time×Condition	-0.004	0.002	[-0.008, 0.000]	-2.043	**.044**
T1/5/FU6/12						
BDI-II	Time	-0.066	0.021	[-0.108, -0.024]	-3.134	**.002**
	Condition(ART)	-1.720	1.334	[-4.360, -0.920]	-1.289	.200
	Time×Condition	0.050	0.030	[-0.009, 0.110]	1.672	.098
STAI-S[2]	Time	-0.077	0.027	[-0.132, -0.023]	-2.815	**.006**
	Condition(ART)	-1.926	1.525	[-4.943, 1.092]	-1.263	.209
	Time×Condition	0.057	0.039	[-0.021, 0.134]	1.454	.149
STAI-T[2]	Time	-0.077	0.023	[-0.122, -0.032]	-3.372	**.001**
	Condition(ART)	-3.276	1.856	[-6.952, 0.400]	-1.765	.080
	Time×Condition	0.020	0.032	[-0.044, 0.084]	0.611	.543

Note. T=measurement, FU6/FU12=follow-ups at 6/12 months, ART=Affect Regulation Training condition, BT=self-help bibliotherapy control condition, BSI=Brief Symptom Inventory, CAPE=Community Assessment of Psychic Experiences, Freq=Frequency, Dis=Distress, BDI=Beck Depression Inventory, STAI-S/STAI-T=State Trait Anxiety Inventory-State/Trait, ERSQ=Emotion Regulation Skills Questionnaire.
[1]Multilevel models without random slopes
[2]Multilevel models with REML
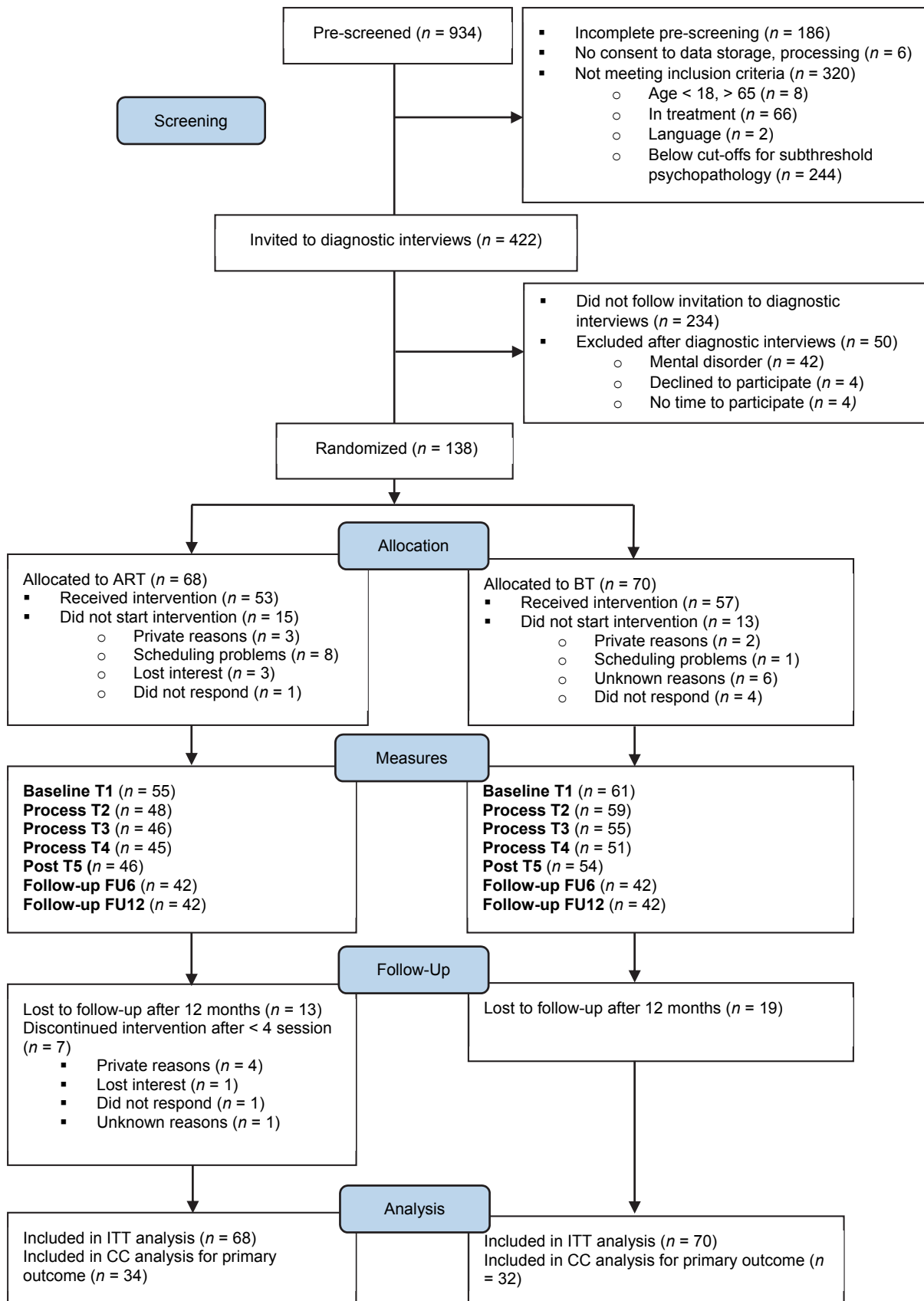
Figure 1 CONSORT flowchart of participants.

Note. ART=Affect Regulation Training condition, BT=self-help bibliotherapy control condition, T1-T5 had a time lag of two weeks. FU6 followed six months, FU12 twelve months after the end of the intervention, ITT=intention to treat, CC = complete case, *N*'s in section measures and analysis are indicated for the primary outcome Brief Symptom Inventory.

Screening	SCID, BSI, CAPE		
T1	BSI, BDI-II, STAI, ERSQ-27	ESM: ERSQ-ES (5m x 6d)	
2 weeks **T2**	BSI, CAPE, ERSQ-27		
2 weeks **T3**	BSI, CAPE, ERSQ-27		
2 weeks **T4**	BSI, CAPE, ERSQ-27		
2 weeks **T5**	BSI, CAPE, BDI-II, STAI, ERSQ-27		
6 months **FU6**	BSI, CAPE, BDI-II, STAI, ERSQ-27	ESM: ERSQ-ES (5m x 6d)	
6 months **FU12**	SCID, BSI, CAPE, BDI-II, STAI, ERSQ-27		

Training 8 weeks
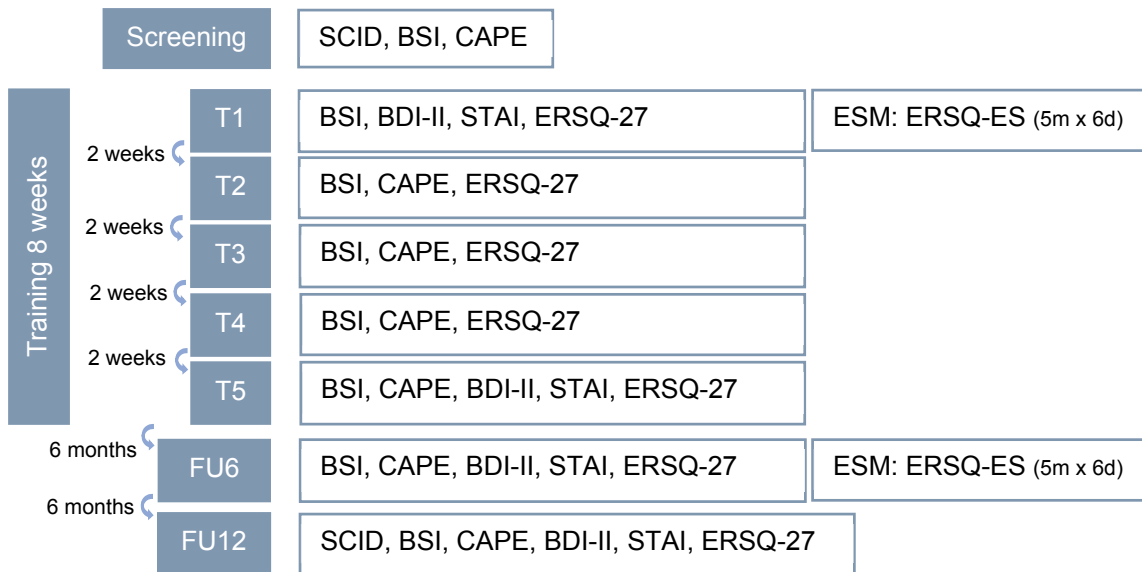
Figure 2 Study design

Note. T=measurement, FU6/FU12=follow-ups at 6/12 months, SCID = Structured Clinical Interview for DSM-IV, BSI=Brief Symptom Inventory, CAPE=Community Assessment of Psychic Experiences, BDI=Beck Depression Inventory, STAI= State Trait Anxiety Inventory, ERSQ-27=Emotion Regulation Skills Questionnaire-27, ERSQ-ES=Emotion Regulation Skills Questionnaire-Emotion Specific, ESM=Experience-Sampling Method, 5m x 6d= six days with five measurements each.

Appendix Studie IV

Measures

Cognitive reappraisal and expressive suppression were assessed with the Emotion Regulation Questionnaire (ERQ, original version: Gross & John, 2003, German version: Abler & Kessler, 2009). The ERQ consists of a subscale on cognitive reappraisal (6 items) and a subscale on expressive suppression (4 items). Participants rate their use of both strategies on 7-point Likert scales (1 = strongly disagree – 7 = strongly agree). The German version showed good internal consistency for the subscale of cognitive reappraisal and acceptable internal consistency for expressive suppression in a validation study (Wiltink et al., 2011).

Wellbeing was assessed with the German version of the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS; original version: Tennant et al., 2007, German version: Lang & Bachinger, 2017). It consists of 14 items that participants rate on a 5-point Likert scale (1 = none of the time – 5 = all of the time), which refer to the past two weeks. The German version has shown excellent internal consistency (Lang & Bachinger, 2017).

Wellbeing in the ESM was assessed with the SWEMWBS, which is the short form of the WEMWBS; original version: Tennant et al., 2007, German version: Lang & Bachinger, 2017). Its consists of 7 selected items from the WEMWBS, which are also rated on a 5-point Likert scale (1 = none of the time – 5 = all of the time). It has shown good internal consistency (Taggart et al., 2016).

The negative emotions anxiety, sadness, anger, shame, insecurity, and loneliness were each rated in their intensity on an 11-point self-report Likert scale (0 = not at all to 10 = very strong). The scale demonstrated good internal consistencies (Cronbach's alpha = .84 - .92) so we used the mean score of all negative emotions as a coefficient of negative emotions.

Level of functioning was assessed with a structured interview called Role Functioning Scale (RFS; Goodman et al., 1993; Lincoln et al., 2012). The scale consists of the four subscales of the immediate social network, the extended social network, work productivity, and independent living, which are all rated by the interviewer on a scale from 0 – 12. The RFS has shown good test-retest and interrater reliability (Goodman et al., 1993).

Paranoid ideation in the ESM was assessed with the German, three-item version of the Paranoia Checklist (PCL-3; Schlier et al., 2016). The included items have been shown to be valid and change-sensitive (Schlier et al., 2016). Items were rated on an 11-point Likert scale (0 = "not at all", 10 = "very much").

Anhang D Studie IV

Table A1
Descriptive statistics for additional outcomes at all measurement points

Outcomes	Group	T1 M (SD)	n	T2 M (SD)	n	T3 M (SD)	n	T4 M (SD)	n	T5 M (SD)	n	FU6 M (SD)	n	FU12 M (SD)/n	n
WEMWBS	ART	45.80 (11.58)	55	47.79 (9.86)	47	49.69 (10.53)	45	49.52 (9.62)	44	50.07 (11.49)	45	49.24 (11.78)	42	52.74 (12.42)	42
	BT	45.08 (10.03)	61	45.65 (9.92)	60	47.14 (11.19)	56	48.54 (10.26)	52	49.33 (11.35)	55	48.38 (12.54)	42	51.60 (10.82)	42
ERQ Suppression	ART	3.47 (1.18)	56	n.a.		n.a.		n.a.		3.23 (1.11)	45	3.34 (1.23)	42	3.21 (1.26)	43
	BT	3.67 (1.46)	61	n.a.		n.a.		n.a.		3.14 (1.42)	55	3.24 (1.52)	44	3.23 (1.47)	42
ERQ Reappraisal	ART	4.08 (1.32)	56	n.a.		n.a.		n.a.		4.91 (0.94)	45	4.81 (1.27)	42	4.78 (1.29)	43
	BT	4.20 (1.15)	61	n.a.		n.a.		n.a.		5.16 (0.95)	55	4.94 (1.09)	44	5.13 (1.06)	42
Negative Emotions	ART	5.25 (2.06)	56	4.42 (2.04)	47	4.30 (2.05)	45	4.22 (1.98)	44	3.70 (2.02)	45	4.45 (2.45)	43	4.44 (2.34)	43
	BT	5.04 (1.94)	61	4.48 (2.04)	60	4.05 (1.92)	56	3.60 (1.78)	52	3.54 (2.00)	55	4.00 (2.20)	47	3.72 (1.94)	43
CAPE Depression Freq	ART	17.07 (3.68)	57	13.87 (4.00)	47	13.38 (3.61)	45	13.18 (3.95)	44	12.67 (3.39)	45	13.55 (3.81)	42	13.09 (4.06)	43
	BT	17.48 (3.62)	61	14.65 (3.51)	60	13.70 (3.01)	56	12.67 (2.68)	52	13.07 (3.08)	55	14.26 (4.02)	43	13.52 (3.30)	42
CAPE Depression Dis	ART	18.89 (4.80)	57	14.81 (5.07)	47	14.31 (5.13)	45	13.86 (5.34)	44	13.44 (4.84)	45	13.62 (4.89)	42	13.37 (5.00)	43
	BT	20.05 (4.80)	61	16.18 (5.18)	60	15.29 (5.06)	56	13.52 (3.51)	52	14.11 (4.85)	55	15.37 (5.70)	43	13.90 (4.51)	42
SWEMWBS ESM	ART	3.32 (0.57)	64	n.a.		n.a.		n.a.		3.69 (0.73)	39	n.a.		n.a.	
	BT	3.22 (0.61)	66	n.a.		n.a.		n.a.		3.65 (0.67)	45	n.a.		n.a.	
Negative Emotions ESM	ART	2.42 (1.22)	69	n.a.		n.a.		n.a.		2.03 (0.90)	40	n.a.		n.a.	
	BT	2.36 (1.06)	67	n.a.		n.a.		n.a.		1.90 (0.77)	46	n.a.		n.a.	
PCL ESM	ART	2.14 (1.41)	69	n.a.		n.a.		n.a.		1.77 (1.10)	40	n.a.		n.a.	
	BT	1.97 (1.07)	67	n.a.		n.a.		n.a.		1.62 (0.79)	46	n.a.		n.a.	
RFS Immediate Social Network	ART	11.11 (0.92)	65	n.a.		n.a.		n.a.		n.a.		n.a.		10.95 (0.92)	39
	BT	10.74 (1.13)	69	n.a.		n.a.		n.a.		n.a.		n.a.		10.85 (1.63)	39
RFS Extended Social Network	ART	9.80 (1.91)	65	n.a.		n.a.		n.a.		n.a.		n.a.		9.74 (2.94)	39
	BT	9.19 (2.07)	69	n.a.		n.a.		n.a.		n.a.		n.a.		9.13 (3.05)	39
RFS Productivity	ART	9.58 (2.60)	65	n.a.		n.a.		n.a.		n.a.		n.a.		10.51 (2.71)	39
	BT	8.78 (2.55)	69	n.a.		n.a.		n.a.		n.a.		n.a.		10.28 (2.91)	39
RFS Independent Living	ART	10.94 (1.04)	65	n.a.		n.a.		n.a.		n.a.		n.a.		10.90 (1.39)	39
	BT	10.72 (1.03)	69	n.a.		n.a.		n.a.		n.a.		n.a.		11.21 (1.26)	39

Note. T = measurement, FU6/FU12 = follow-ups at 6/12 months, n.a. = not assessed, ART = Affect Regulation Training condition, BT = self-help bibliotherapy control condition, ERQ = Emotion Regulation Questionnaire, CAPE = Community Assessment of Psychic Experiences, Freq = Frequency, Dis = Distress, (S)WEMWBS = (Short Version of) Warwick-Edinburgh Mental Wellbeing Scale, ESM = Experience-Sampling Method, PCL = Paranoia Checklist, RFS = Role Function Scale.

Table A2

Complete Case Multilevel Growth Curve Models With Independent Variables Group, Time and Clinical Outcome Variables

Outcomes	Predictors	*B*	*SE*	95% CI	*t*	*p*
T1/2/3/4/5						
Primary Outcome						
BSI[1]	Time	-0.352	0.005	[-0.046, 0.024]	-6.451	**<.001**
	Group (ART)	-0.049	0.082	[-0.210, 0.113]	-0.595	.553
	Time×Group	0.008	0.008	[-0.008, 0.024]	0.955	.341
Secondary Outcomes						
CAPE Positive Freq[1]	Time	-0.203	0.041	[-0.283, -0.122]	-4.984	**<.001**
	Group (ART)	-0.582	0.759	[-2.083, 0.919]	-0.766	.445
	Time×Group	0.000	0.060	[-0.119, 0.119]	0.001	.999
CAPE Positive Dis[1]	Time	-0.234	0.045	[-0.322, -0.145]	-5.221	**<.001**
	Group (ART)	-0.462	0.648	[-1.740, 0.816]	-0.713	.477
	Time×Group	0.021	0.066	[-0.110, 0.151]	0.315	.753
CAPE Negative Freq	Time	-0.530	0.105	[-0.738, -0.321]	-5.050	**<.001**
	Group (ART)	-0.432	1.373	[-3.157, 2.293]	-0.314	.754
	Time×Group	-0.121	0.155	[-0.429, 0.188]	-0.776	.439
CAPE Negative Dis[2]	Time	-0.881	0.133	[-1.146, -0.616]	-6.605	**<.001**
	Group (ART)	-0.585	1.567	[-3.697, 2.528]	-0.373	.710
	Time×Group	-0.039	0.197	[-0.431, 0.353]	-0.200	.842
ERSQ-27	Time	0.061	0.009	[0.043, 0.080]	6.531	**<.001**
	Group (ART)	0.088	0.114	[-0.138, 0.314]	0.771	.443
	Time×Group	-0.004	0.014	[-0.032, -0.024]	-0.297	.767
T1/5						
BDI-II[1]	Time	-0.444	0.112	[-0.666, 0.222]	-3.972	**<.001**
	Group (ART)	-1.456	1.510	[-4.453, 1.540]	-0.964	.337
	Time×Group	0.084	0.167	[-0.248, 0.415]	0.501	.618
STAI-S	Time	-0.676	0.161	[-0.996, -0.356]	-4.196	**<.001**
	Group (ART)	-1.482	1.870	[-5.193, 2.228]	-0.793	430
	Time×Group	0.210	0.240	[-0.267, 0.687]	0.874	.385
STAI-T[1,2]	Time	-0.611	0.130	[-0.869, -0.354]	-4.711	**<.001**
	Group (ART)	-3.333	2.106	[-7.513, 0.847]	-1.583	.117
	Time×Group	0.159	0.194	[-0.225, 0.544]	0.823	.412
ERSQ-ES ESM	Time	0.474	0.093	[0.288, 0.660]	5.074	**<.001**
	Group (ART)	0.143	0.153	[-0.595, 0.445]	0.938	.351
	Time×Group	0.286	0.137	[0.013, 0.559]	2.086	**.040**

Note. BSI = Brief Symptom Inventory, CAPE = Community Assessment of Psychic Experiences, Freq = Frequency, Dis = Distress, BDI = Beck Depression Inventory, STAI-S/-T = State Trait Anxiety Inventory-State/Trait, ERSQ = Emotion Regulation Skills Questionnaire, ERSQ-ES = Emotion Regulation Skills Questionnaire-Emotion Specific, ESM = Experience-Sampling Method.
[1]Multilevel models without random slopes
[2]Multilevel models with REML

Table A3

Complete Case Multilevel Growth Curve Models With Independent Variables Group, Time and Clinical Outcome Variables Including Follow-Ups

Outcomes	Predictors	*B*	*SE*	95% CI	*t*	*p*
T1/2/3/4/5/FU6/12						
Primary Outcome						
BSI	Time	-0.001	0.001	[-0.004, 0.001]	-0.974	.335
	Group (ART)	-0.049	0.091	[-0.242, 0.001]	-0.542	.595
	Time×Group	0.001	0.002	[-0.003, 0.004]	0.442	.660
Secondary Outcomes						
CAPE Positive Freq[1]	Time	0.016	0.006	[0.004, 0.027]	2.692	**.008**
	Group (ART)	-0.321	0.795	[-1.907, 1.264]	-0.404	.678
	Time×Group	-0.015	0.008	[-0.031, 0.001]	-1.834	.070
CAPE Positive Dis[1]	Time	0.002	0.006	[-0.010, 0.014]	0.308	.759
	Group (ART)	-0.276	0.579	[-1.434, 0.883]	-0.476	.636
	Time×Group	-0.013	0.009	[-0.031, 0.004]	-1.558	.123
CAPE Negative Freq	Time	-0.002	0.017	[-0.036, 0.032]	-0.124	.902
	Group (ART)	-0.106	1.601	[-3.302, 3.090]	-0.066	.947
	Time×Group	-0.019	0.024	[-0.066, 0.028]	-0.821	.415
CAPE Negative Dis[2]	Time	-0.028	0.017	[-0.063, 0.006]	-1.631	.107
	Group (ART)	-0.759	1.800	[-4.347, 2.829]	-0.421	.675
	Time×Group	-0.031	0.024	[-0.079, 0.017]	-1.284	.203
ERSQ-27	Time	0.006	0.002	[0.003, 0.009]	3.694	**<.001**
	Group (ART)	0.191	0.117	[-0.432, 0.425]	1.626	.108
	Time×Group	-0.004	0.002	[-0.008, 0.000]	-2.009	**.048**
T1/5/FU6/12						
BDI-II[1]	Time	-0.036	0.025	[-0.087, 0.014]	-1.453	.151
	Group (ART)	-0.677	1.865	[-4.389, 3.036]	-0.363	.718
	Time×Group	0.031	0.035	[-0.039, 0.101]	0.896	.374
STAI-S	Time	-0.066	0.031	[-0.128, -0.004]	-2.125	**.037**
	Group (ART)	-2.088	2.019	[-6.107, 1.931]	-1.034	.304
	Time×Group	0.059	0.043	[-0.028, 0.145]	1.346	.183
STAI-T[1,2]	Time	-0.048	0.025	[-0.097, 0.005]	-1.962	.052
	Group (ART)	-3.683	2.550	[-8.760, 1.394]	-1.444	.153
	Time×Group	0.015	0.035	[-0.053, 0.084]	0.445	.657

Note. T = measurement, FU6/FU12 = follow-ups at 6/12 months, ART = Affect Regulation Training condition, BT = self-help bibliotherapy control condition, BSI = Brief Symptom Inventory, CAPE = Community Assessment of Psychic Experiences, Freq = Frequency, Dis = Distress, BDI = Beck Depression Inventory, STAI-S/STAI-T = State Trait Anxiety Inventory-State/Trait, ERSQ = Emotion Regulation Skills Questionnaire.
[1]Multilevel models without random slopes
[2]Multilevel models with REML

Table A4

Explorative Analysis Concerning Baseline Differences Between Participants With a Diagnosis at FU12 and Participants Without a Diagnosis at FU12

	Diagnosis at FU12		No diagnosis at FU12			
	M (*SD*)/ *n* (%)	*n*	*M* (*SD*)/ *n* (%)	*n*	*t*/χ^2	*p*
Diagnosis lifetime	5 (31.3%)	16	14 (24.6%)	57	0.29	.590
Session attendance (8 total) in ART condition	6.43 (1.13)	7	5.83 (2.27)	29	1.66	.099
BSI at T1	1.03 (0.31)	16	0.65 (0.43)	56	3.23	**.002**
BDI-II at T1	17.50 (7.26)	16	11.89 (7.34)	56	2.70	**.009**
ERSQ at T1	2.36 (0.53)	16	2.48 (0.70)	57	0.65	.516

Note. FU12 = follow-up at 12 months, T1 = baseline measurement, BSI = Brief Symptom Inventory, ART = Affect Regulation Training.

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Anhang F Erklärung zur Prüfungsordnung

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Hiermit erkläre ich,

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